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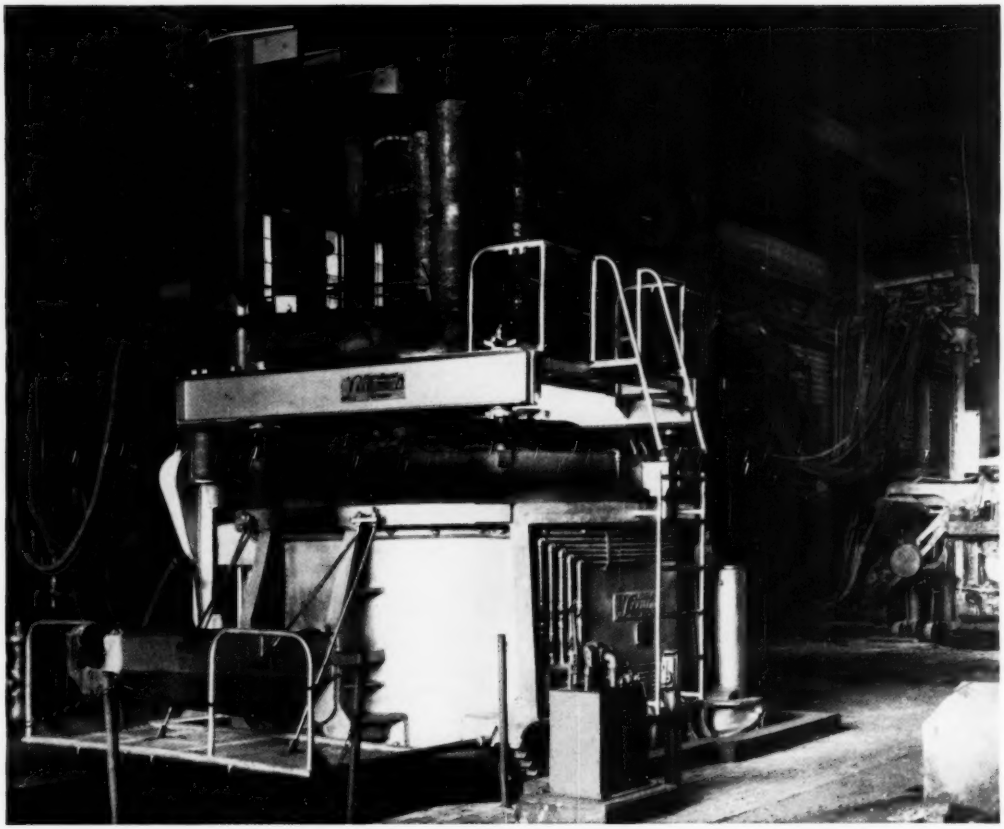
1949

American Foundryman

THE FOUNDRYMEN'S Own MAGAZINE



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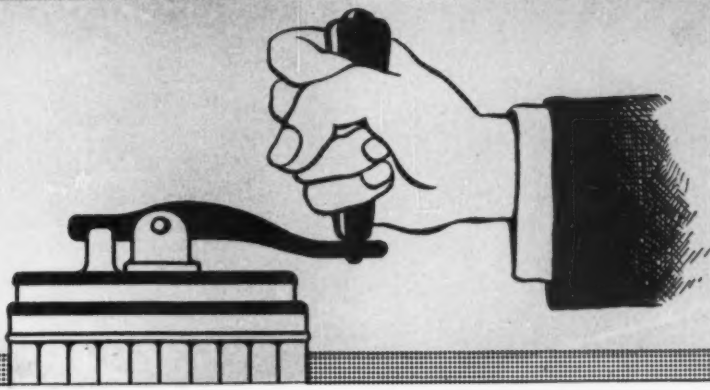

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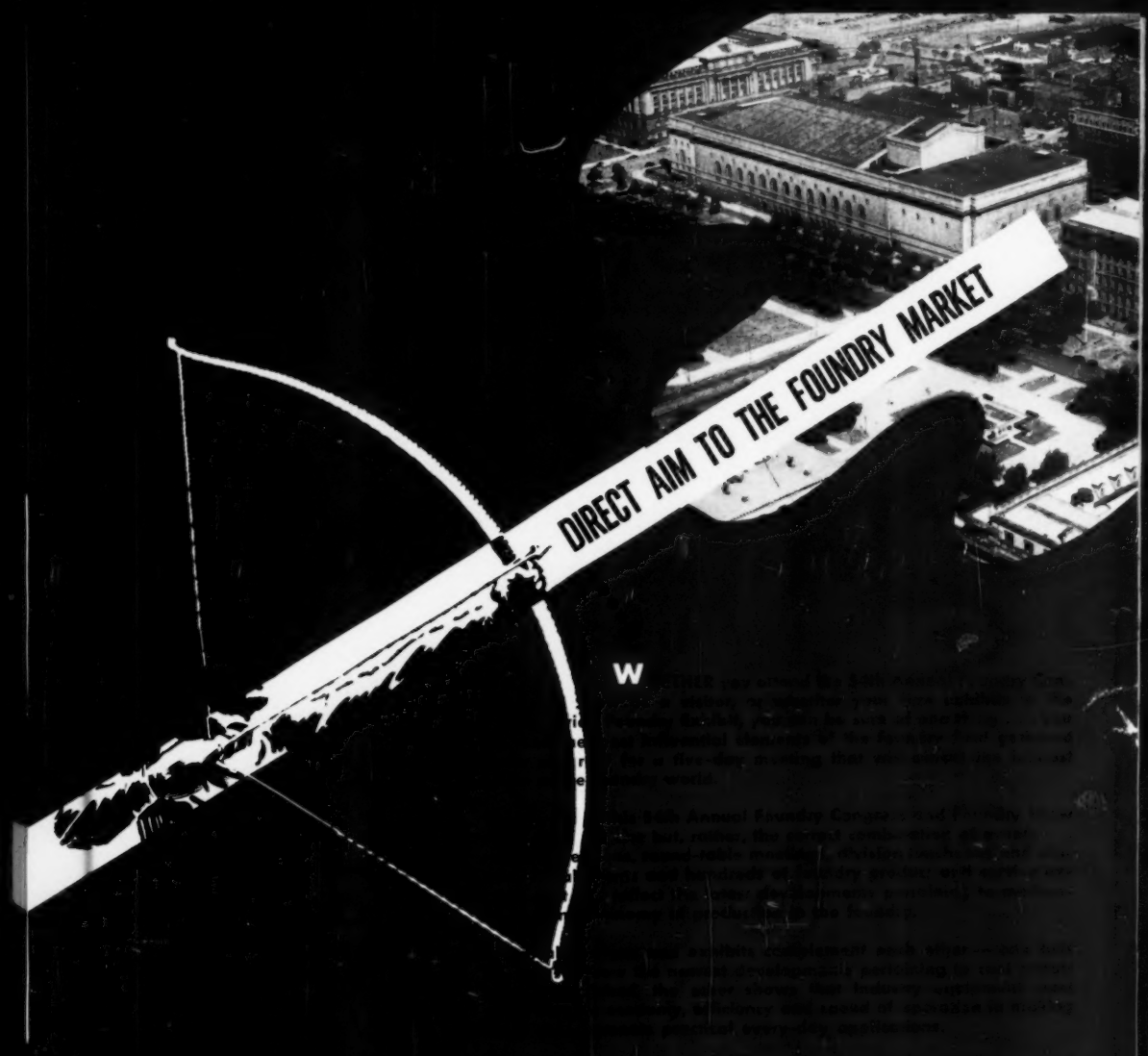

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American Foundryman

December, 1949

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Editorial—Developing the Pattern Industry: V. J. Sedlon

Program and Exhibits Plans for 1950 Foundry Congress

Purdue Metals Casting Conference

First Principles of Gating

Increase Refractory Life in Malleable Melting: Malcolm J. Henley

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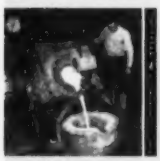
American Foundryman



Tapping carbon steel from a 500-lb induction furnace for experimental castings on the A.F.S.-sponsored research at Armour Research Foundation, Chicago. The project—directed by the Research Committee of the Society's Steel Division—is a fundamental study of the influence of mold conditions on development of hot tears in steel castings. The investigation is one of nine sponsored by A.F.S. to develop foundry fundamentals and interpret them in terms of practical casting production. Condensed report on gating research appears on page 27.

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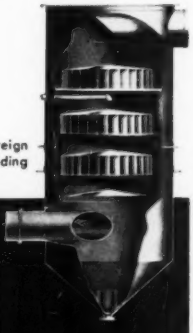

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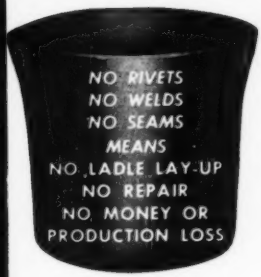

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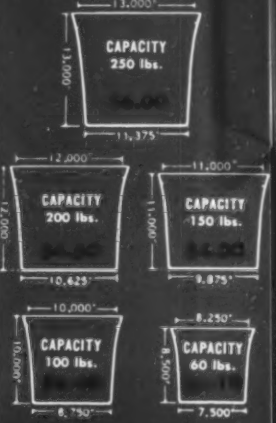

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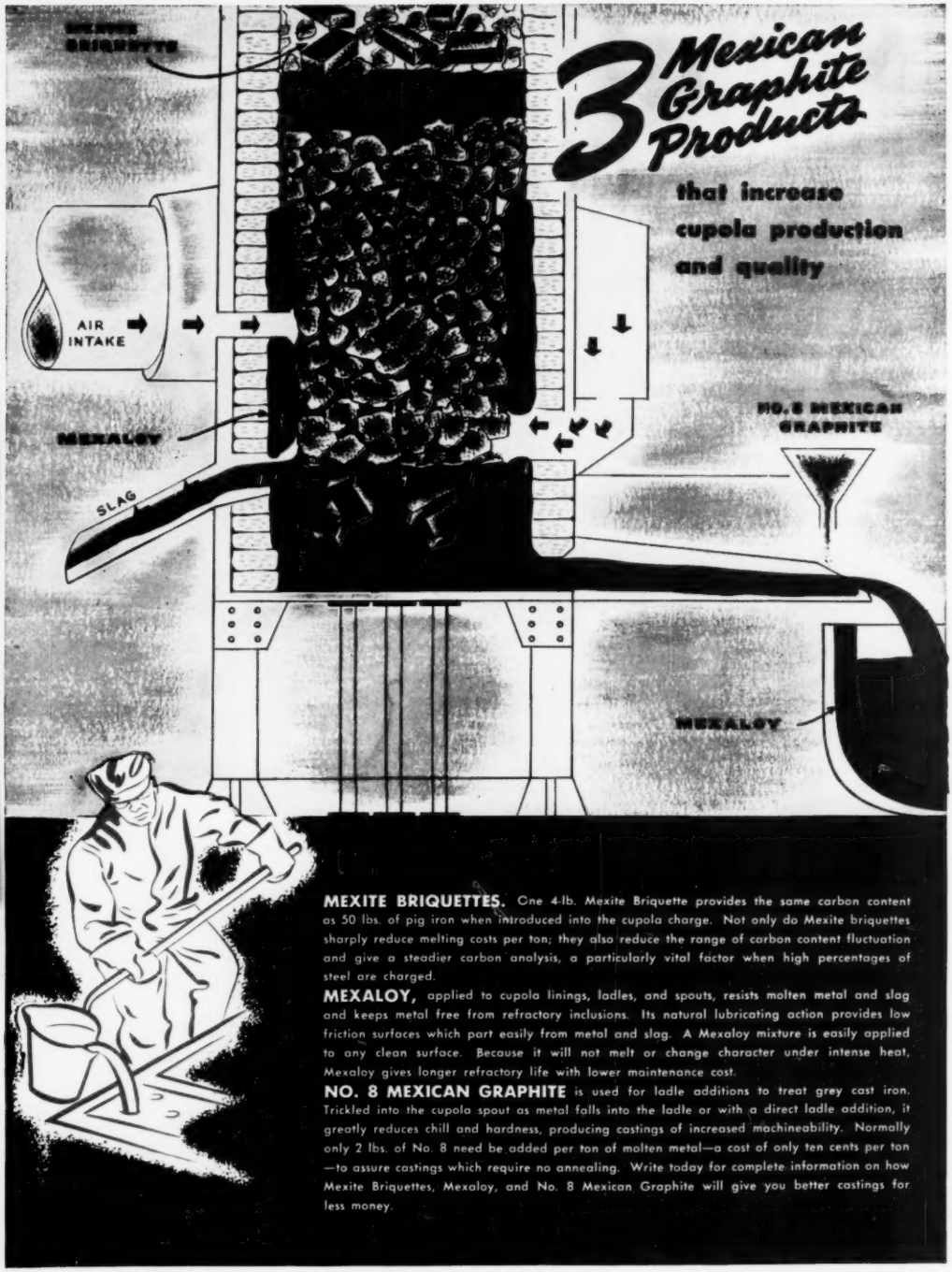

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NO. 8 MEXICAN GRAPHITE is used for ladle additions to treat grey cast iron. Trickled into the cupola spout as metal falls into the ladle or with a direct ladle addition, it greatly reduces chill and hardness, producing castings of increased machineability. Normally only 2 lbs. of No. 8 need be added per ton of molten metal—a cost of only ten cents per ton—to assure castings which require no annealing. Write today for complete information on how Mexite Briquettes, Mexaloy, and No. 8 Mexican Graphite will give you better castings for less money.

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One Thousand, Nine Hundred Forty Nine Times

— this world has celebrated the Birthday of an Idea more precious than the material treasure of a universe — celebrated by festival and the giving of gifts — and men and the children of men have found Happiness in this Day. It is indeed a Pleasant Belief founded upon a spirit of universal fraternity, material helpfulness and personal sacrifice to Friendship. But far more than one thousand, nine hundred forty nine times each year we pay tribute to this great and fundamental spirit of our lives. We give and receive every hour from the cradle to the grave — gifts as intangible and priceless as a Cheerful Word.

— and these things take hold of our destiny — building the Friendships that carry us up through the years. What a dramatic story for each of us would be a complete and faithful record of all we have given and received. If it were printed and bound we would hold such a book beyond price. For Reciprocal Benefit is the True Gold of our Existence. Are we conscious enough of this Wealth—have we a plan for this house we are building? For as surely as rivers flow down to the sea, the friendships that flow into our lives will determine our level. — and as truly as though it were quoted, as we Give so shall we Receive.

One thousand nine hundred forty nine times men have wished one another "Merry Christmas." May our own wish to you stand out sincerely in the midst of Holiday Repetition.

"MERRY CHRISTMAS"

—and may the sand in the hour glass of your New Year be heavy with grains of gold.

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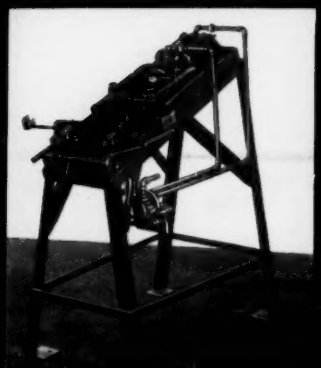
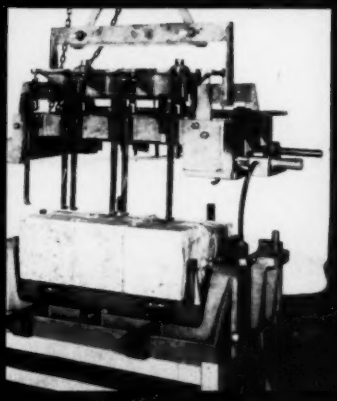
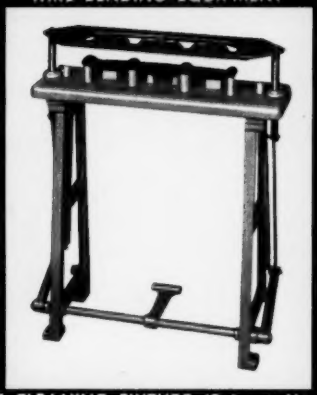


WIRE BENDING EQUIPMENT





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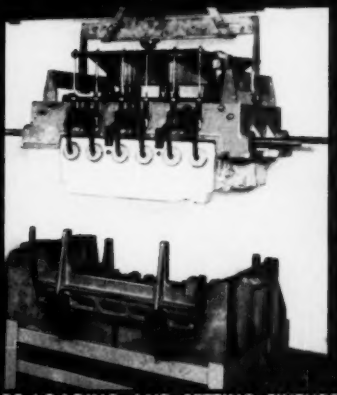

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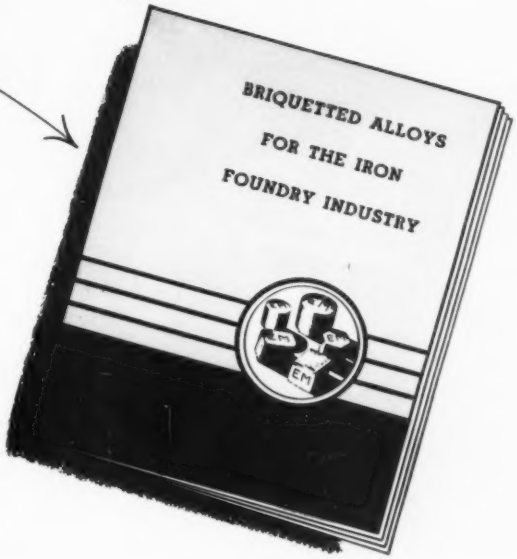

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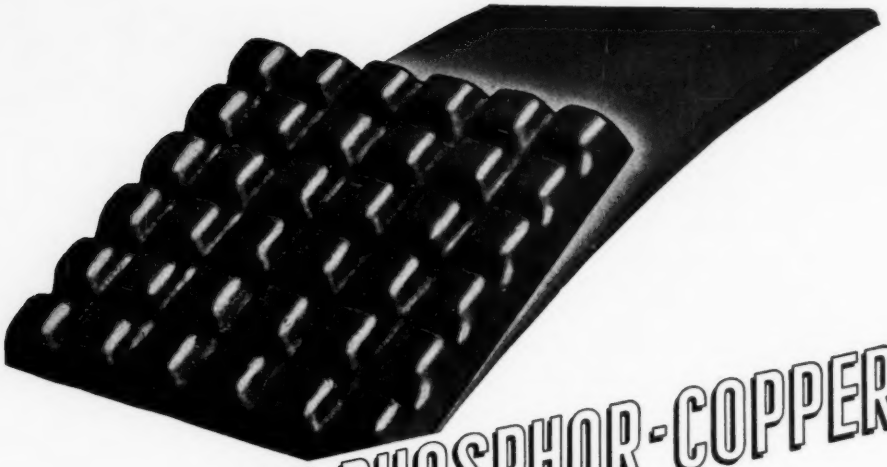

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"Proper Melting Decreases Foundry Losses," contains interesting data. Also, the booklet, "Nonferrous Ingot Metals of Today." Write for both of these. They are free.

Successful foundrymen deoxidize or "clean up" molten metal by a scientific method worth using *as indicated:*

They use phosphorus . . expertly . . in the form of "Ajax Phosphor Copper" . . added as the crucible is removed from the furnace . . for virtually all brass and bronze alloys.

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Famous CORNELL CUPOLA FLUX

Famous Cornell Cupola Flux has changed the cost picture in many leading foundries by greatly reducing the losses caused by casting rejects.

Famous Cornell Cupola Flux does this because it cleanses molten metal of impurities, makes it freer flowing, makes slag more fluid and reduces sulphur.

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SCORED BRICK FORM ***makes it by far the easiest and most economical flux to use.*** **It is pre-measured. All you do is toss this flux into cupola with each ton charge of iron or break off one to three briquettes (quarter sections) for smaller charges, as per instructions.**

Write for Bulletin No. 46-B

MALLEABLE FOUNDRIES, with cupola operation, are showing a rapid trend towards the use of Famous Cornell Cupola Flux. Reports of greatly improved casting production come from every direction. Furthermore, there is a considerable reduction in cupola maintenance labor and cost. The life of cupola lining, whether brick or stone, is greatly prolonged.

NEW DIRECT REPRESENTATIVE FOR WISCONSIN. We are pleased to announce the appointment of Chris T. Jensen, a native of Wisconsin residing in Davenport, Iowa, as direct representative for the entire state of Wisconsin.

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Produces clean, tough castings. No spongy or porous spots even when more scrap is used. Thinner yet stronger sections are poured. Castings take a higher polish. NO FUMES! Exclusive formula prevents obnoxious gases. Metal does not cling to dross.

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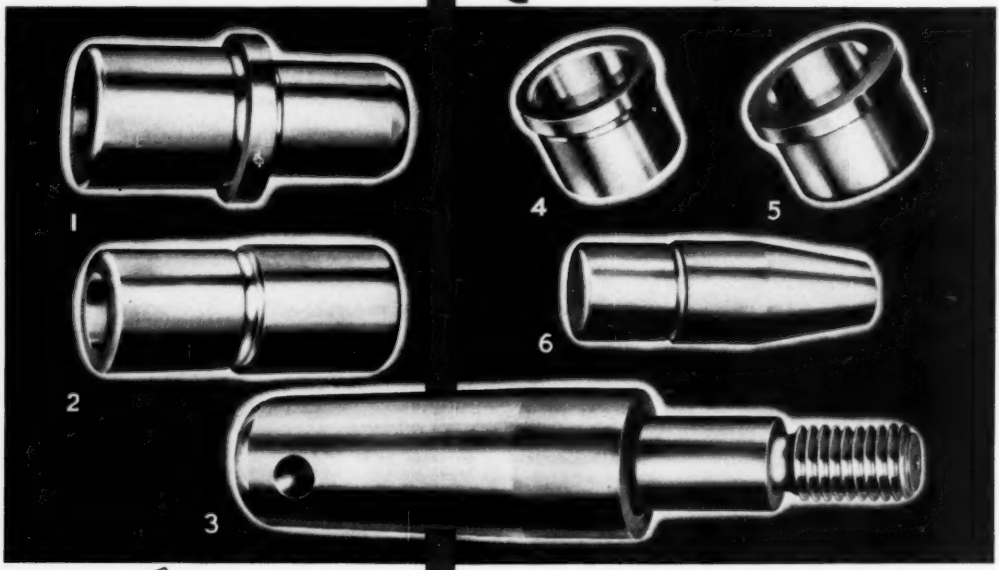
Many of the cope and drag problems encountered in all foundries *are effectively solved* with the use of Universal Flask Pins and Bushings. Whether cast iron, aluminum or steel flasks are used, these modern foundry accessories *insure positive alignment, make possible new production speed.* Hardened and ground for longer life, they are available from stock in various standard sizes and shapes. Special sizes made to order. Write for complete catalog.



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2. Eliminates ash and free carbon which contaminate your sand.
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Zoom along with Chief Keokuk and his Princess Wenatchee! That's what many foundry and steel plants have been doing for many years . . . because they have found that *Keokuk never lets them down!* This dependability plus the dependability of Keokuk Electro-Silvery with its accurate percentages of silicon, iron and alloys . . and its uniformity in size and weight . . . makes *Keokuk the best buy!*

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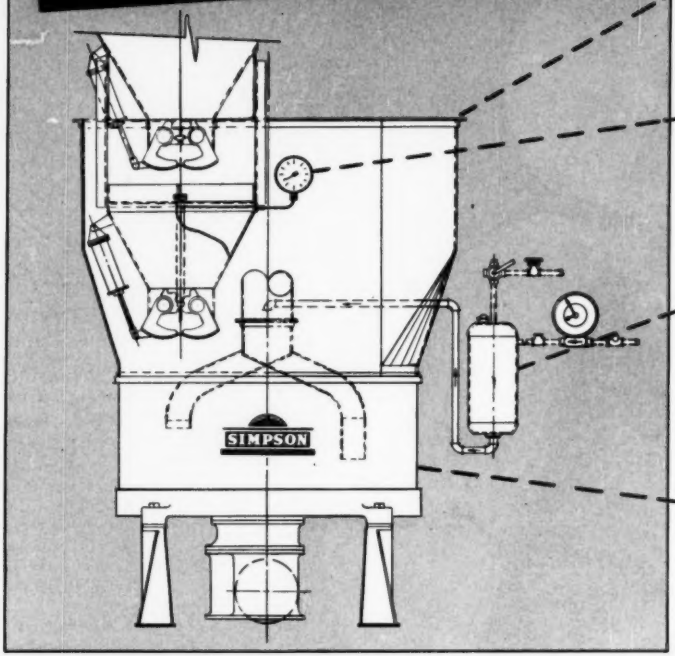
The Foundrymen's Own Magazine

STOP GUESSING—KNOW the moisture content and temperature of prepared sand before it's used . . . .



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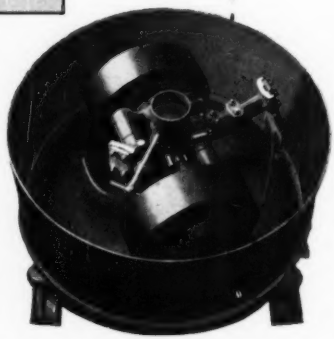

SIMPSON MIXERS equipped with the NATIONAL Cooling Hood—Moisture Master—and Water Injector provide the highest quality prepared sand at controlled temperatures and with accurate moisture content.

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DEVELOPING THE PATTERN INDUSTRY

Predictions of the future of an industry often can be based on a study of its past and present. So it is with patternmaking.

Looking back into the distant past of the foundry industry one wonders whether patternmaking had its beginning when a molder scooped out a cavity with a template or whether molding had its beginning when a patternmaker bedded into sand an article which he had previously fashioned out of wood or some other material. Earliest of patternmakers probably were woodcarvers or sculptors for the true ancestors of the modern pattern, according to Bruce L. Simpson's DEVELOPMENT OF THE METAL CASTINGS INDUSTRY, seem to be the woodcut dies used in molding firebacks in the 1600's.

From this early beginning, modern patternmaking techniques have developed. Although the present day patternmaker takes a blueprint, a piece of rough lumber, and goes through many of the same sequences as his predecessors to produce a pattern, the patterns and pattern materials have changed markedly as they kept pace with the needs of foundrymen.

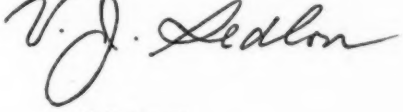
Loose patterns, some of them mounted on follow boards, sand matches or plated on wood boards, are still with us. Gated wood patterns have disappeared like the dodo. So have metal gated patterns, except for use as an original for a match plate or a partial pattern for the plaster molds used to produce pressure cast matchplates.

Stepped up production of casting has given rise to the use of metal match plates, cope and drag equipment, plated patterns machined to a high degree of accuracy, coreboxes fitted for core blowing, and jigs and fixtures for cores and castings. All of this calls for engineering, craftsmanship, and experience. These make possible the equipment needed for higher production of more accurate castings and favorable returns on foundry investments. As the number of skilled men has decreased, modern pattern equipment has filled the gap by reducing the need for molding skill.

Permanent molds, the lost wax process of molding, and the use of frozen mercury patterns in place of wax are not substitutes for traditional patterns. They supplement them and increase the use of cast metal parts. Use of these methods starts where the commonly known patterns leave off. The metal work required to produce permanent molds, and the molds for the wax and mercury patterns, is similar to that for producing metal coreboxes, and often is done in metal pattern shops.

The casting and pattern buyer—unless versed in the services of pattern shops and in the various types of patterns available to him—is handicapped in buying pattern equipment. Much ground work, therefore, needs to be done by the pattern manufacturers to acquaint buyers with this information. Part of this involves educating him to look beyond the initial cost of cheap, poorly planned patterns offered at prices which make a legitimate price quotation based on foundry engineered patterns look ridiculous to the inexperienced pattern buyer.

The pattern industry can help in furthering the cause of well planned patterns by organizing a patternmaking section within each A.F.S. chapter. These groups can invite foundrymen to address them on foundry needs in pattern equipment, can secure speakers on modern pattern production practices, and can make speakers on pattern techniques available to foundry groups, purchasing agent groups, engineering groups, and others. In so doing, the pattern industry will not only help the casting industry but will assure continued progress and a bright future for itself.



V. J. SEDLON
National Director
AMERICAN FOUNDRYMEN'S SOCIETY

V. J. Sedlon, president since 1930 of Master Pattern Co., Cleveland, has been associated with the pattern industry for more than 30 years. Elected a National Director of A.F.S. at the 1949 Convention, he has for many years been active in the Pattern Division of the Society, having been a division chairman, and is still serving on the Executive Committee. Mr. Sedlon has spoken before many A.F.S. chapters and other groups on patterns and permanent molds and has addressed meetings at the A.F.S. Annual Convention. His papers have appeared in AMERICAN FOUNDRYMAN *and* TRANSACTIONS *of the Society, and other publications.*

PROGRAM AND EXHIBITS PLANS WELL UNDER WAY FOR 1950 FOUNDRY CONGRESS

ORGANIZATION AND CORRELATION of the many phases that go into the makeup of the 1950 A.F.S. Congress and Show, to be held May 8-12, 1950, in the Municipal Auditorium, Cleveland, have received impetus in recent weeks through meetings of technical committees, exhibits groups, members of the host chapter and the A.F.S. National Office staff to establish Convention programs and policies.

TECHNICAL PROGRAM

The A.F.S. Northeastern Ohio Chapter, hosts to the 1950 Foundry Congress and Show, met in Cleveland November 10 with Alfred A. Hilbron, A.F.S. Convention and Exhibits Manager, to form host chapter committees for the Convention. Chairmen and committeemen named are:

General Committee: Honorary Chairman, A.F.S. National Vice-President Walton L. Woody; Chairman, William G. Gude, Penton Publishing Co.; Vice-Chairman, Fred J. Pfarr, Lake City Malleable Co.; Secretary, A. J. Harlan, Hickman, Williams & Co.; Treasurer, F. Ray Fleig, Smith Facing & Supply Co.; W. E. Sicha, Aluminum Co. of America; H. C. Gollmar, Elyria Foundry Division; and H. J. Trenkamp, Ohio Foundry Co.

Chairman and personnel are being established for the Reception, Northeastern Ohio Day, Shop Courses, Banquet, Ladies' Entertainment, Plant Visitations and Publicity Committees and will be published in a future issue of AMERICAN FOUNDRYMAN.

HOST COMMITTEES

Plans for the Convention's technical sessions are nearing completion and the tentative program, as mentioned above, will be mailed in the near future. Several A.F.S. technical divisions have already met to formulate their Convention plans and a large number of technical papers submitted for presentation at the Convention have been approved.

The A.F.S. Gray Iron Division has scheduled a symposium on the production of nodular iron, to be sponsored jointly with the Malleable Division; a Round Table Luncheon, three Shop Course sessions and a number of technical meetings. The Shop Course Committee met November 18 to make plans for the popular evening sessions, open to Cleveland area foundrymen at no charge, as well as to registered Convention attendants. In addition, the Cupola Research Committee will make a progress report on its project.

Plans of the Malleable Division, in addition to joint sponsorship of the symposium on nodular iron, to date include presentation of a paper sponsored by its Controlled Atmosphere Annealing Committee.

The Time Study & Methods Committee has tentatively scheduled a session on development of bench coremaking standards, and a joint meeting with the A.F.S. Cost Committee for presentation of papers showing how coordination between standards and cost departments gives maximum service to management.

Other program highlights planned for the Convention to date are the annual Sand Shop Courses, to be held evenings and open to local foundrymen; a discussion of cleaning room equipment sponsored by the Plant and Plant Equipment Committee; two sessions of the A.F.S. Educational Division relating to (1) college level foundry courses, and (2) trade and high school level and or in-plant training; and a symposium on the properties of centrifugally-cast metals, sponsored jointly by the American Society for Testing Materials and the American Foundrymen's Society.

The A.F.S. Aluminum & Magnesium Division, meeting October 3 in Cleveland tentatively plans to pre-

sent papers on magnesium fluxing, fluid flow of metals in molds (experiments in gating), a progress report on the Division's Research Project at Battelle Memorial Institute, high strength magnesium alloys, Canadian magnesium casting practices, and non-ferrous metal practice. The Aluminum & Magnesium Round Table will be a feature of the Division's program, and its subject will be announced at a later date.

The 1950 Exchange Paper of the Institute of British Foundrymen to the A.F.S. Convention will be *"Aluminum Alloy Castings – A Review of British Achievement,"* by Frank Hudson, Development & Research Dept., Mond Nickel Co., Ltd.

APPRENTICE CONTEST

The A.F.S. Apprentice Contest, now in its 27th year, opened September 15 and will continue until late in March, when the National Judging will take place in Cleveland. First place winners in the five contest divisions—Gray Iron Molding, Steel Molding, Non-Ferrous Molding, Wood Patternmaking and Metal Patternmaking (new this year)—will have their round trip rail and Pullman fare paid to the Convention, where A.F.S. National President Edwin W. Horlebein will award them $100 prizes and certificates.

Four chapters—Detroit, Wisconsin, Southern California and Northern Illinois-Southern Wisconsin have already entered the Contest, with several more chapters planning to do so in the near future.

Eight companies have announced their intentions of conducting in-plant contests in preparation for the National Contest—Frank Wheatley Pump & Valve Manufacturer, Tulsa, Okla.; Builders' Iron Foundry, Providence, R. I.; Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.; Tractor Works and McCormick Works of the International Harvester Co., Chicago; Caterpillar Tractor Co., Peoria, Ill.; Continental Foundry & Machine Co., East Chicago, Ind.; and Progress Pattern & Foundry Co., St. Paul, Minn.

The newly-created fifth division of the Apprentice Contest, Metal Patternmaking, has aroused considerable interest. Castings for the Metal Patternmaking contest have been made by the City Pattern, Foundry & Machine Co., South Bend, Ind., through the courtesy of company vice-president George L. Garvey. City Pattern also made the patterns for the three molding divisions of the Contest. The patterns were finished by F. W. Burgdorfer, Missouri Pattern Works.

Shipping boxes for patterns were made by the Pettibone Mulliken Corp., Chicago, courtesy of Vice-President C. V. Nass, and by the McCormick Works of the International Harvester Co., Chicago, courtesy of E. E. Schwantes, training director.

Any apprentice is eligible to enter the 1950 A.F.S. Apprentice Contest, provided he is taking a regular training course of not less than three years' duration and is not over 24 years old on the day he makes his pattern or mold. For veterans the age limit is 24 plus length of service in the Armed Forces. Further Contest information may be obtained from Jos. E. Foster, Technical Assistant, American Foundrymen's Society, 222 West Adams St., Chicago 6, Ill.

EXHIBITS

A folder containing a floor plan of the Municipal Auditorium's exhibit halls, Convention rules and regulations and general information, together with space application blanks, was mailed November 28 to all past and prospective exhibitors. Convention housing applications and a tentative program will be mailed to the membership early in 1950. Interest in the 1950 Show is high, as already evidenced by the large number of foundry equipment manufacturers who have announced their intentions of having operating exhibits.

Issue Chapter Manuals This Month

FOUR COPIES of the A.F.S. MANUAL FOR CHAPTER OFFICERS AND DIRECTORS will be sent this month to each of the 40 chapters of the American Foundrymen's Society, and one copy to the faculty advisor of each student chapter. Handsomely bound in looseleaf form, the Manual consists of 108 pages plus an appendix consisting of the A.F.S. MANUAL OF ESTABLISHED POLICIES AND PRACTICES OF THE BOARD OF AWARDS.

Designed to meet the problems of chapter officers and furnish them with guidance in the fulfillment of their duties, the Manual covers the history and policies of the A.F.S., by-laws, A.F.S. technical and research work: A.F.S. publications, AMERICAN FOUNDRYMAN, national, regional and chapter functions; organization and conduct of chapters; chapter and national nominations and elections; and specific sections for the guidance of chapter chairmen, secretaries, treasurers, etc.

In addition, there are sections devoted to the functions of chapter program, membership, educational, by-laws, publicity and entertainment committees. Each of these sections will be reprinted for distribution to the chapter committees concerned.

Concluding the Manual are sections on educational courses, chapter nominations and elections, chapter finances, student chapters, regional conferences and the annual Chapter Officers' Conference.

THIS PROBLEM OF AIR POLLUTION

ALTHOUGH SOME SMOKE ORDINANCES date back to about 1920, metallurgical equipment was usually "exempted in toto." Ordinances enacted about 1947 began to specify dust and fly ash loadings emitted by a stack and generally refer to any furnace, manufacturing equipment or machine. Law enforcement groups, inspection groups, etc., were organized under these ordinances but since the field of air pollution was relatively new—and the public had to be educated to the purposes of the ordinances—no immediate enforcement was attempted. Enforcement groups have since carefully analyzed the ordinances.

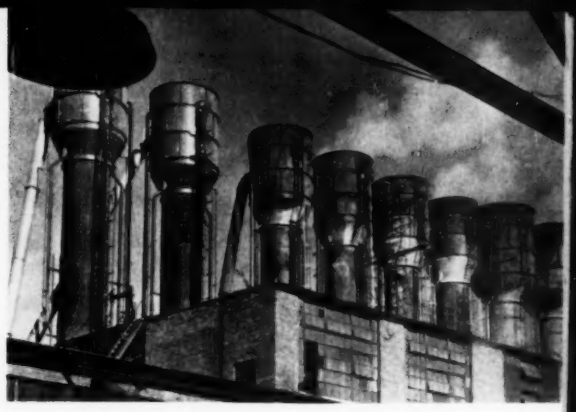
Several incidents have occurred which have aroused public interest. In the Donora, Pa., incident, for example, the surgeon general released a report of the work done by engineers, chemists, physicians, dentists, nurses, and the Weather Bureau. This investigation took the full time of 25 Public Health Service experts in industrial hygiene for one year. Commenting at a news conference with Surgeon General Leonard A. Scheele, Oscar R. Ewing, federal security administrator, called for immediate attention to the long range problem of air pollution. He stated that federal, state, and local agencies must cooperate with industry on air pollution control in each industrial city and town, and that the problem is of major importance. Studies are now under way which will attempt to determine the extent to which the health of people living in such communities is affected by air contamination.

Residential and Rural Districts

Cupolas operated in or near residential areas constitute a problem to the neighbors. In one case the burning of front porch steps and the pitting of paint on cars and homes can be traced to hot coke particles issued by a cupola. The people in this area have long known that to have a wood shingle roof was to invite a fire. The women hang out their wash on days when the foundry is idle. On damp, foggy days, when the smoke flows along the ground, there have been complaints of bad odors, etc.

Industry located in rural areas does not escape the problem because various farmer's organizations have acted to prevent them from emitting anything that will damage crops or mar the landscape.

An examination of some of the ordinances enacted reveals that they are not uniform as to the quantity of material that may be emitted by a stack. Neither are they uniform with respect to permissible smoke densities during light-up periods, or the time alloted for light-ups. In Table 1 it will be noted that in some cases no limit is specified at all. Under such circumstances the quantity of emission becomes a matter of judgment on the part of the smoke abatement officer.



Cupolas in this large automotive foundry have been equipped with wet type smoke and fume suppressors.

When quantities of emission are specified the variation is found to be from 0.30 to 0.75 grains per cubic foot of stack gas. As shown in Table 1 these limits are adjusted on the basis of permissible excess air during testing or an adjustment for carbon dioxide. The 0.30 grains per cu ft limit is incorporated in the model smoke law of the American Society of Mechanical Engineers. The determinations are made using the test procedure outlined in the *Test Code for Dust Separating Apparatus,* published by ASME in 1941.

It is interesting to note how at least one of these figures was obtained. From all that can be determined the loading figure of 0.30 grains per cu ft is based upon the amount of material emitted while running a normal underfeed stoker at normal rating. Although this may be a desirable limit, it has never been determined whether a particular cupola installation can meet it.

In some ordinances a weight limit is stated for 1000 lb of gas adjusted to a 12 per cent carbon dioxide concentration. Others state that 15 per cent of the amount entering a collector may be emitted. The Los Angeles ordinance states the amount of emission in terms of throughput with a limit of 40 lb for a throughput of 60,000 lb. It is believed by equipment manufacturers that cupola suppressors of the present type will have difficulties in meeting the stated limit. Los Angeles foundrymen are watching the closed top cupola with great interest.

Basis for Density Definitions

Most ordinances define the permissible density of smoke during light-up (Table 2) in terms of Ringelmann Chart* numbers and state the time allotted for them. Various methods are used to express this. For instance, the Baltimore ordinance states that smoke of a density of No. 2 or less on the Ringelmann Chart shall be permitted for a total of 9 min or less during an hour or No. 2 or more for 6 min or less during the hour. The Detroit ordinance states that smoke of a density of No. 2 or less shall be permitted for 4 min in 30 min or No. 3 or less for 3 min in 15 min.

The times written into these ordinances do not coincide with any metallurgical operations. Since they

**Ringelmann Smoke Chart or Scale of Smoke Densities,* Information Circular 6888, U.S. Bureau of Mines, Department of Interior, June, 1945.

differ widely in the manner of statement it would be best for each foundryman to get a copy of the ordinance that pertains to his locality. It would also be desirable to get the inspector's interpretation of this section of the ordinance inasmuch as the section on smoke density was originally intended to apply to boiler installations.

Although various references have been made to permissible amounts of emission, no reference has been made to any data obtained from cupola operation because no accurate measurements have been made to determine the actual amounts of emission under various conditions. According to data available at present a cupola lined to 60 in., melting about 15 tons per hr, will issue about 30 lb of dust per ton. More measurements are being made as a background for the revision of ordinances. These, however, will take considerable time as instrumentation and methods, although worked out for boilers, have to be altered for cupola testing.

Although data are not available to engineer a perfect dust suppressor, cupola operators can do several things to decrease the material emitted from their cupolas. Effluent gas volume is approximately 1½ times the incoming air volume. Thus, the gases pass the charging door with considerable velocity. Materials are charged countercurrent to this flow. Hence, fines are buoyed upward by the effluent gases, passing up the stack to collect on the foundry roof. If the wind is sufficiently strong and in the right direction, particles emitted go beyond the foundry property where they are usually termed a nuisance.

Velocities are greater at the time of charging, since the charging bucket constricts the cupola. Returns with loose sand, scrap with dirt and loose corrosion products, coke with fines, weathered limestone, and poorly compacted briquets dropped into the cupola cause a disturbance of the fine materials allowing them to be carried away by the effluent gases. Thus, the emission can be made up of several elements together with very small amounts of sulphur dioxide from the coke and carbon monoxide from incomplete combustion.

TABLE 1—MAXIMUM EMISSIONS OF PARTICULATE MATTER

City or County	Ordinance No.	Date Enacted or Last Revision	Emission of Dust or Fly Ash: Maximum Emission, grains/cu ft stack gas	Temperature at Which Measurement Taken, °F	Amount Retainable on 325 Mesh Sieve, grains/cu ft stack gas	Measurement Made When Excess Air Is not Greater than, %
Baltimore	292	Jan. 1, 1947	0.75	500	0.20	50
Birmingham, Ala.	523F	1944	Control over carbon smoke only.			
Buffalo	66	Apr. 12, 1947	Ordinance does not define definite quantities. Emission of quantities injurious to person or property is a nuisance.			
Chattanooga	2747	Mar. 1, 1949	Ordinance does not define definite quantities. Emission of quantities injurious to populace or property prohibited.			
Cincinnati	90-1947	1947	Ordinance does not define definite quantities. Emission of quantities injurious to populace or property prohibited.			
Cleveland	1204-48	Oct. 19, 1948	0.425	500	—	50
Columbus, Ohio	236-46	Apr. 30, 1946	0.85 lb/1000 lb stack gas adjusted to 12 per cent CO_2.			
Denver	94	Sept., 1948	No control over these items.			
Detroit	167-E	Oct. 16, 1947	0.30	500	—	50
Erie, Pa.	8324	Mar. 1, 1948	Ordinance does not define definite quantities. Emission of a nuisance nature prohibited.			
Grand Rapids, Mich.	427	Feb. 28, 1921	Ordinance does not define definite quantities. Emission of a nuisance nature prohibited.			
Indianapolis	—	1925 New ordinances being written	0.30	500	Maximum discharge to be 0.85 lb /1000 lb stack gas, or 0.40 grains/cu ft. The indicated limits are to be included in the new ordinance.	
Los Angeles		Apr. 5, 1949	0.40	The emission is limited to 40 lb for a stack with a throughput of 60,000 lb. The emission is limited on the basis of throughput; at 50 lb throughput the limit is 0.24 lb.		
Louisville	59 Series 1945	Sept. 18, 1945	Ordinance does not define quantities. Emission of quantities injurious to populace or property prohibited.			
Milwaukee County, Wis.	Chap. 88	Mar. 26, '48	0.85 lb/1000 lb stack gas adjusted to 12 per cent CO_2.			
Niagara Falls, N. Y.	Art. XVII	1947	0.85 lb/1000 lb stack gas adjusted to 12 per cent CO_2, or emission of 15 per cent of that entering collector is permitted.			
Pittsburgh	344 of 1941	Oct. 1, 1947	0.75*	500	0.20	50
			* To be changed to 0.30.			
Seattle	No ordinance. Most plants are electrically operated.					
St. Louis	44499	Apr. 6, 1948	0.85 lb/1000 lb stack gas, of which 0.50 lb/1000 lb stack gas can be retained on a 325 mesh U.S. Std. Sieve.			
Syracuse, N. Y.		Aug. 2. 1948	0.85 lb/1000 lb stack gas adjusted to 12 per cent CO_2, or emission of 15 per cent of that entering collector is permitted.			
Toledo, Ohio	342-46	Sept. 23, 1946	0.85 lb/1000 lb stack gas adjusted to 12 per cent CO_2.			

Starting New Fires

Cupola light-up is an important factor in operating procedures. The times allotted and smoke densities permitted when starting new fires in stationary combustion equipment are shown in Table 2.

Oil and wood light-ups are regarded in some communities as violations of the smoke ordinances. Both create a concentration of smoke due to volatile matter content that is beyond the maximum specified by them. To avoid this difficulty several cupola operators are using electric igniters. Coke fines are used with the electric igniter (AMERICAN FOUNDRYMAN, August, 1949, page 48) and since the volatile matter present is comparatively low there is little smoking.

Various techniques of decreasing emitted material in the effluent gases can be used with or without suppressors. First, anything that can be done to decrease dusting at the charging door is a step in the

With growing public recognition of the air pollution problem, the A.F.S. Cupola Research Committee has included stack emission control in the scope of its activities. First article on the subject, this paper is the seventh in a series on modern cupola operation prepared by the A.F.S. Cupola Research Committee for publication in *American Foundryman*.

right direction. Removal of coke fines is imperative. If screening is not possible chutes can usually be arranged at an angle. Holes in the bottom plate permit fines to drop through as the coke comes down from the hopper. This arrangement is not the best but it will help a great deal. Coke charged by hand should be forked with forks whose tines are at least 3 in. apart.

Charging buckets discharging with impact break coke into smaller pieces creating fines that are carried away by the effluent gases. At the same time, the impact disturbs all the fine materials that come in with the metal charge. Intermediate coke charges during normal periods should be made as soon as the melting stock is one charge down to avoid dropping the material too far.

Check Sand Quantities

Although it is desirable to charge a certain quantity of sand to obtain good slag fluidity, sand carried out by effluent gases is of no value. Since a slag balance can be reached with lesser quantities of both sand and limestone, it is good practice to separate loose sand from the returns before placing them in the charging buckets. Separation can be done magnetically or by dropping returns onto a set of inclined bars. A container under the bars catches the down-coming sand.

Some foundries use large quantities of steel and cast iron briquets. In a number of operations these are compacted without removing the cutting oil from the chips. Cutting oils, although possessing a high volatilization temperature, will distill off in the upper part of the cupola stack. This has a tendency to disintegrate the briquets and block the smooth flow of cupola gases. Operators using water curtain dust suppressors find that the cutting oil vapors pass through the curtain.

Some of the material emitted is combustible and part of it is burned at or above the charging door. The amount burned is dependent upon the carbon monoxide content of the effluent gases, higher carbon monoxide contents giving higher flame temperatures in the stack. If sufficient air is present some of the combustibles, such as coke breeze and the distilled cutting oil, can be burned, lessening the amount of material emitted. However, precautions must be taken to insure continuous burning. Sudden gusts of wind through the charging doors cause turbulence which may put out the flames. Burners placed above the charging doors are recommended to insure continuous combustion.

TABLE 2—DENSE SMOKE EMISSION

City or County	Time and Density of Smoke Permitted When Building a New Fire (Stationary Combustion Equipment) Minutes in Stated Period	Capacity of Umbrascope: Density No. of Smoke Referred to Ringelmann Chart	No. of Gray Glasses Specified	Ringelmann Shade Equiv. of Gray Glass	Light Reduction of Glass, %	Power of Light in Candles
Baltimore	9 min or less in hr 6 min or less in hr	2 In excess of 2	No provisions made for its use.			
Birmingham, Ala.	20 min 6 min of 20 min period Also 3 min in 30 min after above period Total of 20 min in 60 consecutive min	3 In excess of 3 3 or darker 3 or darker	4	3	60	24
Buffalo	10 min in calendar day 2 periods of 6 min in calendar day	In excess of 3 In excess of 3	No provision made for its use.			
Chattanooga	6 min in hr	2 or greater	No provision made for its use.			
Cincinnati	6 min in 24 hr	Shade No. 4 as indicated under Capacity of Umbrascope	4	60 (Note: Shade No. 1—1 glass; Shade No. 2—2 glasses; Shade No. 3—3 glasses; Shade No. 4—4 glasses.)		
Cleveland	10 min in any hr (foundries classified as class No. 4 plants)	2	Can be used if referred to Ringelmann Chart.			
Columbus, Ohio	3 min in 30 min 8 min in 30 min	Greater than 2 2	No provision made for its use.			
Denver	9 min in hr	Not to exceed 3	No provision made for its use.			
Detroit	3 min in 15 min	Not to exceed 3	Satisfactory if correlated to Ringelmann Chart			
Erie, Pa.	20 min in day	Not to exceed 3	No provision made for its use.			
Grand Rapids, Mich.	5 min in hr	Equal to or greater than 3	No provision made for its use.			
Indianapolis	Unknown		Unknown			
Los Angeles	Unknown		Unknown			
Louisville	6 min in hr	Equal to or greater than 2	No provision made for its use.			
Milwaukee County, Wis.	9 min in hr 5 min in hr	Equal to but not to exceed 2 Unlimited density	No provision made for its use.			
Niagara Falls, N. Y.	3 min in 15 min	Equal to but not greater than 3	No provision made for its use.			
Pittsburgh	9 min or less in hr 6 min or less in hr	2 or less In excess of 2	No provision made for its use.			
Seattle	See Table I					
St. Louis	6 min or less in hr 9 min or less in hr	In excess of 2 2	No provision made for its use.			
Syracuse, N. Y.	6 min or less in hr 9 min or less in hr	In excess of 2 2	No provision made for its use.			
Toledo, Ohio	3 min in 15 min	Equal to 2 but not greater than 3	No provision made for its use.			

These suggestions do not exhaust the list. Each cupola operator will have to examine and study his individual problem. Many smoke abatement officers believe that each case must be considered on the basis of location of the source and with reference to the surrounding area. They do not want to be more specific until they have obtained more experience on which to base more definite requirements. They are approaching the problem cautiously.

It is desirable that foundrymen work with smoke abatement officers and groups so that information compiled will be technically correct. The nature of the rewritten ordinances will to a great extent depend upon the information that they have at hand. As a matter of fact the design and operation of the cupola may be determined by the decisions made by the cooperating groups.

PRODUCT IMPROVEMENT OUTLINED AT METALS CASTING CONFERENCE

PROCESS CONTROL for economy and product improvement was the theme of this year's Metals Casting Conference at Purdue University, Lafayette, Ind., November 3 and 4. Sponsored by Purdue, and the Michiana and Central Indiana Chapters of A.F.S., the two-day meeting was under the general chairmanship of C. T. Marek, associate professor of manufacturing processes. Program chairman was Paul H. Harlan, Electric Steel Castings Co., Indianapolis, Ind.

The conference was opened by Prof. H. A. Bolz, head of general engineering and Engineering Dean A. A. Potter. A.F.S. Vice-President Walton L. Woody, vice-president of National Malleable & Steel Castings Co., Cleveland, responded to Dr. Potter's welcome by commending Purdue and other universities for placing due emphasis on foundry instruction and increasingly identifying themselves with a vast basic industry —the foundry. He outlined the functions of the American Foundrymen's Society, commenting on the educational work being carried out by the various chapters.

Reviews Nodular Iron Development

First technical speaker was C. O. Burgess, Gray Iron Founders' Society, Cleveland, who reviewed the development and present status of nodular iron. Meeting chairman was George M. Enos, professor of metallurgical engineering, who brought his entire class to the meeting to get first hand information on the new ferrous material. In explaining how it differs from gray iron, Burgess showed a picture of a 1⅛ in. round of nodular iron which had been hot rolled to a ¼ in. plate.

Sulphur is probably the most critical element, said the speaker, pointing out that magnesium and cerium both combine preferentially with it. Manganese has no sulphide forming function in nodular iron and can therefore be kept down to about 0.3-0.4 per cent if good ductility is desired. This complicates production, Mr. Burgess said, because low sulphur pig generally contains high manganese. Need for low sulphur probably will revive interest in basic lined cupolas, the speaker predicted.

Probable uses of nodular iron include automobile crankshafts, valve bodies, slag pots, ingot molds, printing and filter press frames, agricultural machinery, pressure pipe, diesel crankshafts and other diesel engine parts, compressor heads, dies, and differential covers according to Mr. Burgess.

A.F.S. Vice-President Walton L. Woody (center), National Malleable & Steel Castings Co., Cleveland, poses between sessions with Prof. H. A. Bolz of Purdue University (left) and L. L. Andrus, American Wheelabrator & Equipment Corp., Mishawaka, Ind.

Prof. George M. Enos (starting left), Ralph L. Lee, Grede Foundries, Inc., Milwaukee, and C. O. Burgess, Gray Iron Founders' Society, study the program.

The afternoon session was devoted to costs with Ralph L. Lee, Grede Foundries, Inc., Milwaukee, speaking on *"Cost Records and Methods of Determining Costs,"* and Prof. M. E. Mundel, general engineering department, discussing *"Cost Reduction in the Foundry Through Motion Study."* Session chairman was J. F. Krueger, department of general engineering.

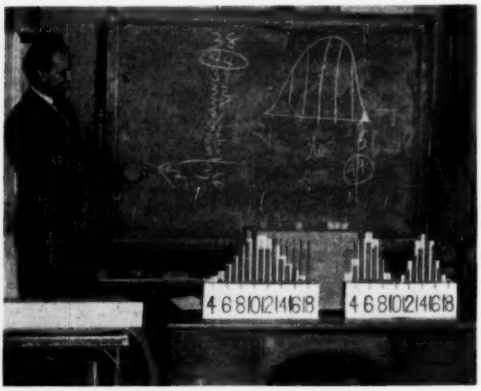
Explains Modern Cost Methods

Mr. Lee explained cost methods used in the various Grede plants and illustrated the various forms used in keeping records. He emphasized the need for getting cost figures back to the operating departments by the next day if the information is to be used most effectively. This can be done, he said, if the bulk of the operations are on a standard cost basis.

An unusual feature of the foundry cost estimate sheet used for quoting on gray iron castings, Mr. Lee pointed out, was an extra column for quoting on the

basis of improved pattern equipment if the foundry could visualize a better method of production.

Dr. Mundel said that motion study is a formalized procedure for studying methods of using materials, equipment, and manpower. Motion study can be applied profitably to any operation in any field, he declared, and cited seven studies illustrating typical foundry applications. These were: coremaking (achieved a 30 per cent cost reduction), mechanical blasting (35 per cent reduction in cost), making



Arthur Bender, Delco-Remy Corp., Anderson, Ind., shows how a series of test results can follow a normal distribution curve and help in controlling processes.

chills, changing blow plates, making and processing test bars, cost accounting, and shakeout.

In arriving at a better method of operation, Dr. Mundel recommended a possibility guide for listing all possibilities for changing production methods. Variations can be made, he said, in the raw materials, in the product design, in the process, in the motion pattern, and in the tools, equipment, and work area.

Develop a methods research program with top management first, declared Mundel, so managers can make use of the techniques themselves and so they will know what to expect of lower supervision in achieving cost reduction through motion study.

Banquet Speech Covers World Affairs

Principal speaker at the banquet ending the first day's meetings was L. M. Sears, professor of history, who spoke on *"World Affairs—the Latest Phase."* Toastmaster was L. L. Andrus, American Wheelabrator and Equipment Corp., Mishawaka, Ind.

Second day's sessions were set up primarily for operating men and covered gating, process control, and foundry sands. First speaker was A.F.S. Technical Director S. C. Massari who provided the commentary for the motion picture, *"Fluid Flow in Transparent Molds,"* a progress report on the Society's research project sponsored by the Aluminum & Magnesium Division. One of nine carried on by A.F.S., the details on the project reported to date appear in the current issue of TRANSACTIONS, Vol. 57, mailing of which started the middle of November. (A condensation of the progress report appears on page 27 of this issue of AMERICAN FOUNDRYMAN.)

Principles of gating are being studied, declared Mr. Massari, and the results of the work will be useful to all foundrymen. As the film was shown, he pointed out the applications of fluid flow dynamics and the slow motion pictures brought out the sources of turbulence in pouring box, sprue, runner, and ingate.

"Controlled Product Through Controlled Processes" was the topic of Arthur Bender, Delco-Remy Corp., Anderson, Ind., the next speaker. Dr. I. W. Burr, Purdue mathematics professor, was chairman. Mr. Bender explained and illustrated graphical representation of series of readings and test results. If you can assign a number and develop a graphical pattern, asserted the speaker, you can develop better control because the pattern brings out factors not obvious from superficial examination of data.

T. E. Barlow, Eastern Clay Products, Inc., Jackson, Ohio, at the closing session, discussing sand grain distribution and the relative merits of wide and narrow screen analyses. Photos on this page were provided by Wilfred H. White of the Jackson Iron & Steel Co., Jackson, Ohio.

Final conference speaker was T. E. Barlow, Eastern Clay Products, Inc., Jackson, Ohio, who discussed sand problems at a session presided over by Conference Chairman Marek. We have made real progress in developing new methods of sand testing, the speaker said, but it is doubtful if equal progress has been made in applying the results of the tests.

Mr. Barlow cited a number of examples of apparent disparity between sand theory and practice and showed how these are essentially the result of over-simplification of theory in order to explain a complex subject.

The conference closed with a visit to the Michael Golden engineering laboratories where foundry students demonstrated sand testing.

Committee members who assisted Conference Chairman Marek and Program Chairman Harlan were: H. A. Bolz, head of general engineering; Jack W. Giddens, International Harvester Co., Indianapolis, Ind.; F. A. Honer, Woodward Pattern Works, South Bend, Ind.; W. F. Lange, Casting Service Corp., La-Porte, Ind.; R. W. Lindley, chairman, manufacturing processes laboratory; S. C. Massari, A.F.S. technical director; V. S. Spears, American Wheelabrator and Equipment Corp., Mishawaka, Ind.; Robert Spurgin, III, Swayne, Robinson & Co., Richmond, Ind.; and S. Franklin Swain, Golden Foundry Co., Columbus, Ind.

FIRST PRINCIPLES OF GATING

Progress Report on One of Nine A.F.S. Research Projects

RESULTS OF THE A.F.S. RESEARCH PROJECT on fluid metal flow—sponsored by the Aluminum & Magnesium Division and developing information useful in all fields of metal casting—confirm some techniques of gating and condemn others. Report to date refers only to gating practice applicable to castings having substantial lateral dimensions but relatively small vertical height. Most graphic story of the work is the motion picture which has been shown or scheduled for most of the A.F.S. chapters and a number of plants. Published herewith is a condensed report—details appear in the 1949 annual TRANSACTIONS of A.F.S., Vol. 57.

Avoiding Air Entrainment

Present studies show that air entrainment occurs in the vortex formed at the top of the sprue and at all points in the gating system from the runner box to the mold cavity where an abrupt change in direction or abrupt increase in cross-sectional area of the flow channel occurs. It is likely that, when using sand molds, generation of gas pressure from mold gases will definitely accentuate entrainment of gas. Gating design, therefore, should avoid such opportunities for gas entrainment and, at the same time, allow a decrease in flow velocity before the liquid enters the mold cavity.

Even though the gating system from pouring box to mold cavity is properly designed, air will be entrained by the liquid stream through the vortex at the top of the sprue during the initial portion of the pouring operation. If this vortex is not eliminated by an adequate head of liquid in the pouring box, or if the entire mold is poured directly down the sprue, the benefits of a good gating design will be nullified. Time to fill the gating system should be minimized and the metal which enters the gating system during this period should be regarded as having inferior quality because of the entrained air and dross. In general, this damaged liquid should not enter the mold cavity. To minimize the quantity of this damaged metal, the following practices appear to be necessary or beneficial:

1. A pouring box is mandatory and the liquid should be poured into it at the end opposite from the sprue.
2. Ideally, the first liquid should not be permitted

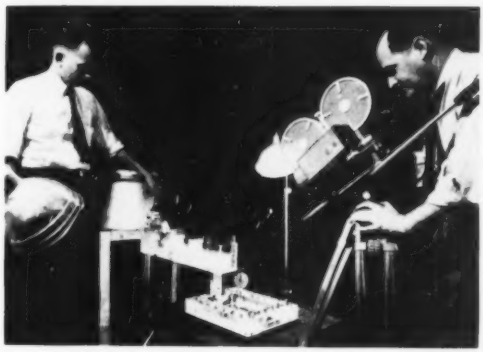


Fig. 1.—High-speed motion picture photography of fluid flow phenomena in gating system of transparent mold.

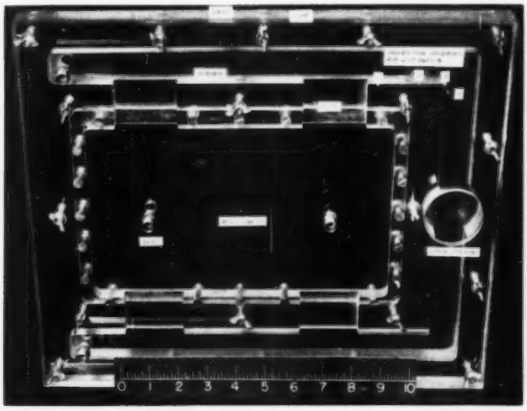


Fig. 2.—Transparent mold with square-cornered gating system of proportions approximating common practice.

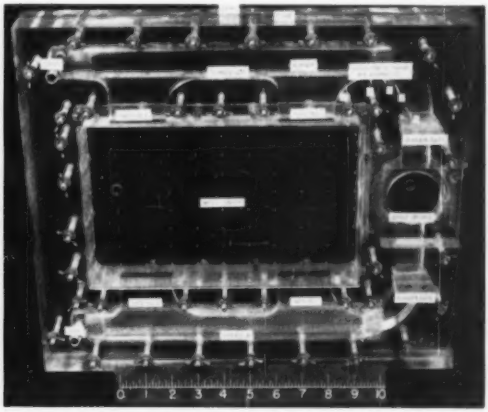


Fig. 3—Rounded corners in this transparent test mold minimize chance for aspiration of air through mold wall.

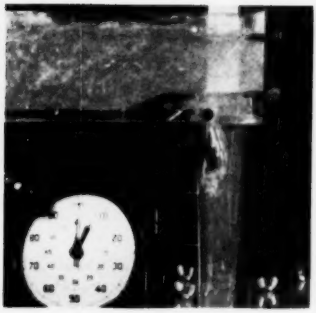


Fig. 4—Air pocket hanging from square-cornered edge of pouring box orifice causing entrainment of air.

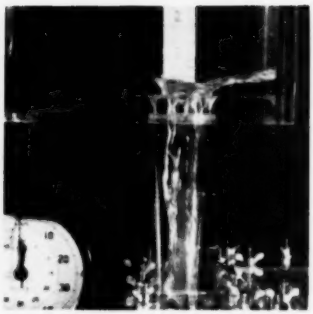


Fig. 5—Air entrainment sprue due to vortex in partially filled pouring box. Enlarged from the film.

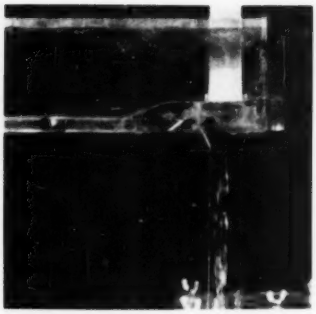


Fig. 6—White streaks in sprue show air aspiration through wall of poorly designed and untapered sprue.

to pass into the mold cavity; therefore, to at least partially accomplish this, it appears desirable that the runner be placed in the drag with the gates connecting it to the mold cavity placed above in the cope.

3. Devices should be used to facilitate rapid filling of the pouring box. Such devices are a plug at the top of the sprue which can be removed or which will melt out in a short interval after the pouring box has been filled. Another device is a fusible plug or dam across the runner near the base of the sprue.

Study Turbulence And Aspiration

The aim of the research project has been to establish fundamental principles of gating through an experimental technique permitting fluid flow to be observed and photographed. The procedure used, and depicted in the A.F.S. research film "*Fluid Flow in Transparent Molds*," involved transparent plastic molds into which water, with or without a suspension of aluminum powder, or Wood's metal were poured. Flow phenomena were recorded by slow motion photography.

The mold was necessarily impermeable, thus approximating permanent mold rather than sand mold conditions. Perforation of the mold wall with a 0.04 in. drill, however, gave information on pressures within the mold and indicated probable behaviour if the mold were made of sand. Fluid behavior of water and the light metals differs primarily in that water has a lower surface tension and chemical reactivity. Nevertheless, indications are that occurrence of air bubbles in the water flowing through the gating system is a reasonable and convincing measure of the degree of damage suffered by the liquid during the pouring operation.

Ten different sprue designs, three different pouring boxes, and two different designs of molds. (Fig. 2 and 3) have been employed in the investigation. Study has been concentrated on turbulence and aspiration of mold gases. Water flow through the various gating systems corresponded to a flow of 190 to 410 pounds of liquid aluminum per minute.

Early in the investigation a conventional pouring box design was used. The abrupt change in direction of flow at the right-angle corner where the sprue joined the box produced an air pocket (Fig. 4) which caused a continuous admixture of air into the liquid flowing down the sprue. This was eliminated by rounding and funnelling the top of the sprue. Failure to keep the pouring box sufficiently full to prevent formation of a vortex (Fig. 5) and pouring directly down the sprue or close to it caused entrainment of air.

High speed photographs of ten different types of sprues having various tapers, and rectangular, round, and slotted cross sections showed that all untapered sprue designs aspirated air through the vents in the sprue wall (Fig. 6). A sprue with the big end down, corresponding to the type attached permanently to match plates, aspirated a considerable amount of air. Aspiration increased as flow rate increased and was greatest near the top of untapered sprues.

Ideal sprue design is illustrated in Fig. 7 which also shows the type of sprue base preferred. This sprue base was developed after tests showed that usual gating systems trap air at the bottom of the sprue which is gradually carried into the mold cavity. A well at the

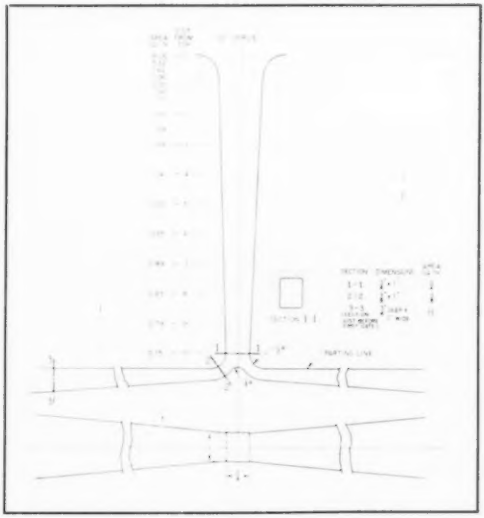
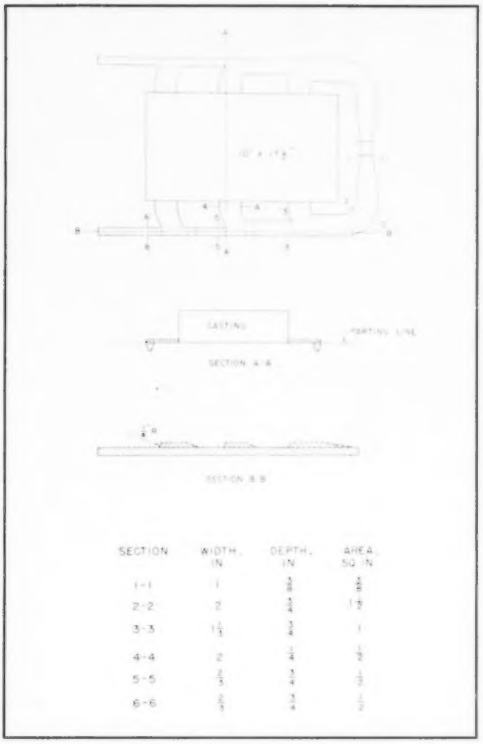


Fig. 7—Ideal sprue and sprue base design showing minimum taper on 10-in. sprue of 3/4 sq in. base area.



SECTION	WIDTH, IN	DEPTH, IN	AREA, SQ IN
1-1	1	$\frac{3}{4}$	$\frac{3}{4}$
2-2	2	$\frac{3}{4}$	$1\frac{1}{2}$
3-3	$1\frac{1}{3}$	$\frac{3}{4}$	1
4-4	2	$\frac{1}{4}$	$\frac{1}{2}$
5-5	$\frac{2}{3}$	$\frac{3}{4}$	$\frac{1}{2}$
6-6	$\frac{2}{3}$	$\frac{3}{4}$	$\frac{1}{2}$

Fig. 8—Runner and gate designed to avoid abrupt changes in cross-sectional area and flow direction.

sprue base is ineffective if not actually harmful.

Study of runner and gate design showed that square corners should be avoided in the runner to prevent aspiration of air through the mold wall (Fig. 9). Even with rounded corners aspiration occurred at high flow rates. A screen or other restriction placed across the gate considerably reduced air aspiration into the runner. Abrupt changes in cross-sectional area such as may exist between runner and gate also cause separation of the fluid from the gate walls and entrainment of gas (Fig. 10).

To overcome all these difficulties, a suggested design of a runner and gate system for a flat plate, such as that used in this experimental work, is illustrated by Fig. 8. The essential features of this design are:

1. Employment of a sprue and runner design at the base of the sprue, as illustrated by Fig. 7.

2. Gradual fourfold increase in cross-sectional area of the runner between the sprue and the first gate.

3. Avoiding abrupt directional changes in gates.

4. Employment of a total cross-sectional area of the first gate (Section 4-4, Fig. 8) plus the cross-sectional area of the runner just beyond the first gate (Section 3-3) equal to the cross-sectional area of the runner (Section 2-2) just before the first gate. This eliminates any abrupt change in cross-sectional area of the flow stream at this point, and insures more equal distribution of liquid through each gate into the mold cavity.

Reduce Flow Velocity

5. Avoidance of abrupt changes in cross-sectional area at all locations in the gating system, from the top of the sprue to the mold cavity, but the velocity of flow of the liquid stream is gradually reduced by 4:1 by employing a ratio of the cross-sectional area of the bottom of the sprue : total cross-sectional area of the gates = 1:4. With this design, no abrupt changes in cross-sectional area or in direction occur, and the velocity of flow is reduced so that minimum splashing occurs when the liquid enters the mold cavity.

The work reported to date and condensed here was conducted by R. E. Swift, research fellow, and J. H. Jackson and L. W. Eastwood, supervisors, at Battelle Memorial Institute, Columbus, Ohio, under the joint sponsorship of Battelle and the American Foundrymen's Society. The project, expected to run five years, was initiated by and is under the general supervision of the Research Committee of the Society's Aluminum & Magnesium Division. Members of the committee —at the time this work was done—headed by R. F. Thomson, International Nickel Co., Detroit, were: W. E. Sicha, Aluminum Company of America, T. D. Stay, Reynolds Metals Co., and Walter Bonsack, Apex Smelting Co., all of Cleveland; W. J. Klayer, Aluminum Industries Inc., Cincinnati, and C. E. Nelson, Dow Chemical Co., Midland, Mich.

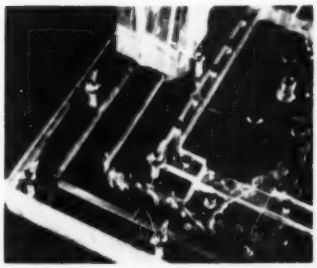


Fig. 9—Air bubbles caused by aspiration through vents near square corner of runner show negative pressure.

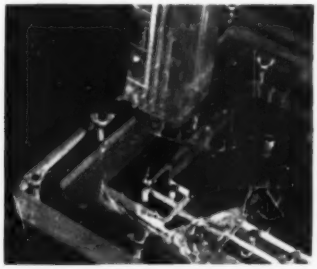


Fig. 10—Fluid separates from gate at abrupt increase in cross-sectional area and causes gas entrainment.

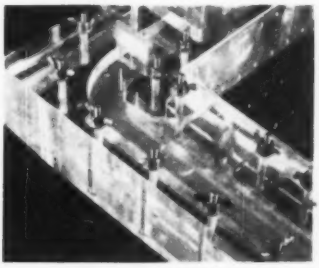


Fig. 11—Rounded runner corner avoids aspiration of air and fluid separation if flow rate is not excessive.

INCREASE REFRACTORY LIFE IN MALLEABLE MELTING

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Research Met.
Texas Foundries, Inc.
Lufkin, Texas

REFRACTORIES ARE IMPORTANT raw materials in malleable melting, and constitute a large factor in operating costs. In the duplex type of malleable melting, the cost of refractories per melted ton in the cupola is about 50 per cent of the refractory cost in the air furnace.

Demands on the melting equipment vary in each foundry, and this demand, along with the type of equipment, will dictate the quality of the refractory necessary for satisfactory operation.

Charging equipment in the author's foundry is of the skip-hoist type. In some cases this type of charging equipment tends to pack the charged materials on the opposite side of the stack. This condition causes the blast to channel and most of the metal is melted on one side of the cupola, creating a serious refractory problem on long heats.

Many types of cupola blocks were tried in attempts to overcome this difficulty and at the same time use the available charging equipment. It was found that silica blocks would give satisfactory service and were economical for long heats. Spalling was not a factor since the silica brick was used only in the channel area and for five or six rows about the tuyeres, and these blocks were replaced after each heat.

A swing door was installed over the lip on the skip hoist charging bucket so that the materials being charged would be deflected and cause less packing. The amount of deflection of material is governed by a counterweight on the loose end of the door, or by a stop which rests against the opposite side of the cupola when the bucket is in charging position.

Cupola Charge Centered

By this method the channel could be diverted to the opposite side of the stack, and by experiment it was possible to correct the weight on the loose end of the door and cause the material to drop in the center of the stack, thereby equalizing the burn-out in the melting zone. Not only did this appliance serve the purpose of reducing or eliminating channeling of the blast, but it increased the refractory life above the melting zone to the charging door by at least 50 per cent.

Air furnace linings are generally considered by sections since refractories in certain parts of the furnace are subjected to different operating conditions. Many foundries use a stiff mud brick for laying the side walls, at least above the metal line, because it is dense and will resist slag and abrasion, has good load bearing qualities, and a minimum amount of spalling.

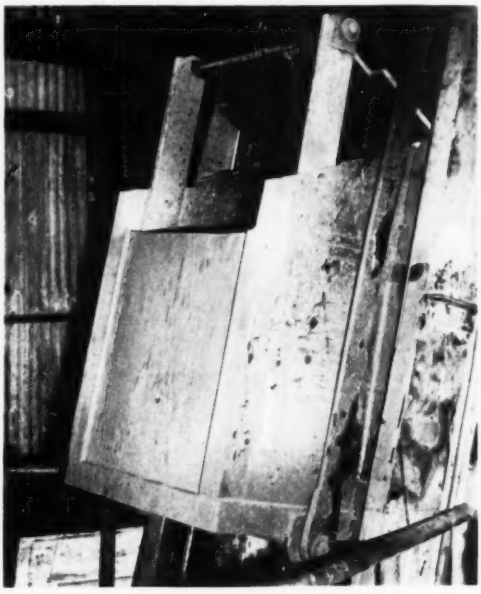
This paper was presented at the Malleable Round Table Luncheon, 53rd Annual Meeting, American Foundrymen's Society, at St. Louis, May 3-5, 1949.

Many opinions have been expressed as to the proper brick to be used in the bottom of the air furnace. In this foundry many qualities of brick have been used for the air furnace bottom, and only within the past two years has a 70 per cent alumina brick been adopted as standard. This brick has given the best service, and the quality and dimensions are uniform.

It is of little value to buy first-quality brick unless the same practice is followed in selecting the mortar. We use sillimanite around the tap-hole area, and another grade of mortar in the remainder of bottom and side walls, and feel that the quality of the mortar is one of the most important factors in refractory life. Recently many foundrymen have attributed furnace bottom troubles to faulty mortar rather than the brick used.

The method of laying the bottom is also important. In this foundry the brick is dipped, the rows started in the center and keyed snugly and uniformly against side walls. The brick are then tightened with wooden wedges and, finally, ground brick is rammed into the space left between bottom brick and side wall brick. The dip mortar is mixed to a consistency that will float a brick with about one-fourth of the brick above the surface. The method gives excellent results, but con-

A counterweighted swinging door installed over the lip of the skip-hoist charging bucket controls the direction of discharged materials into the stack. Stops may be used on the door instead of counterweights.



siderably more time and close supervision are required.

The method used in laying bottom depends largely upon the depth of the burn of the brick before replacements. Many foundries replace sections of the bottom and do not burn a large amount of brick off before replacement. We replace the entire bottom at one time and naturally burn the brick down considerably, which requires the full length of brick to be tied firmly.

Depth of the concave surface placed in a bottom is debatable. We use about a 3-in. dip, but extend the arc only about 36-in. in the middle of the furnace and then lay the bricks in a straight line tangent to the arc of the dip. This method gives more brick area

We have tried extra length (13-in.) brick in the bottom and probably obtained some extra life. These bricks were less uniform in dimension which made them difficult to lay, and over a long period the extra cost could not be justified.

From a cost standpoint the saving of labor in replacing a bottom is as important as the cost of refractories. For some time now we have been using a 9x6¾x2½-in. brick rather than the convenional 9-in. straight brick to lay the bottom, and have realized about 30 per cent saving in man hours.

We do not know a good measure for determining the life of a furnace bottom; probably each foundry will have to set its own standard. We are quite sure

Air furnace bottom brick are laid with a 3-in. dip in the middle, the arc of the dip extending about 36 in. The remaining brick are laid on a straight line tangent to the arc of the dip. The template travels on a layer of reference brick laid at the bottom of the side wall. By this means the proper bottom fall is maintained from the bridge to the tap hole. Wooden wedges are used to hold the brick in position until ground fire brick has been rammed between bottom and side walls.

tied down near the side walls, especially after a few heats have been run.

The practice of replacing the entire air furnace bottom rather than repairing a portion of it, as is the common practice, was adopted for several reasons. First, we have only one air furnace and cannot afford to take the risk of a bottom floating which would stop production. Second, we have never had much success with joints between old and new parts of the bottom, and third, in our operation we believe that a new bottom is the most economical procedure. We usually make a major repair on side walls, which means the side walls from the tap hole area to the front bridge wall, after 3 weeks of operation, and replace the bottom and side walls after 6 weeks. If we were to replace a portion of the bottom and complete side walls, it would probably mean this expense for one week's operation. Many foundrymen will contest this statement, but so far this has been the case in our shop.

In at least one foundry the air furnace bottom is laid in five sections with 2-in. layers of rammed mullite between each section of brick. It is claimed that this method of laying the air furnace bottom makes it much less difficult to repair one or more sections.

that brick or 9-in. equivalents or refractory cost per ton are not comparable between different shops unless tonnage, tapping temperature, fuel and many other factors are comparable. Some companies graph weekly or monthly tonnages against 9-in. equivalents per melted ton and find it to be a straightline function, and by this graph brick requirements for given tonnages can be predicted.

Bung life seems about the same in most duplexing shops. We have tried spraying or coating the bung brick with a highly refractory material and realized somewhat more bung life, but we are not sure that this is an economical operation. As in most foundries, we replace the bungs in hot areas and use the partly burned bungs in colder areas of the furnace, thus realizing some extra bung life.

Operating precautions may be taken to prolong refractory life. We have been very careful to cool the brick slowly and keep it as warm as possible between heats without using too much fuel. Some foundries alternate furnaces daily in order to let the brick cool, or probably better to reduce the depth of heat penetration into the brick, and in so doing extend the refractory life.

A.F.S. EXECUTIVE, TECHNICAL COMMITTEES HOLD MEETINGS

PLANS FOR SOCIETY and technical activities during coming months have been effected through recent meetings of the Executive Committee of the A.F.S. Board of Directors, and of committees of the various technical divisions of the Society.

Meeting October 14 in Chicago, members of the Executive Committee of the A.F.S. Board of Directors heard reports on membership and finances, publications and the A.F.S. Cupola Research Project. A.F.S. National officers and directors attending the meeting were: President Edwin W. Horlebein, Vice-President Walton L. Woody, and Directors Frank C. Riecks, John M. Robb, Jr., and V. E. Zang.

Recommend A.F.S. Bookkeeping Revisions

President Horlebein stated that the A.F.S. Finance Committee, meeting in Chicago October 13, had considered and approved recommendations of the Society's official auditors for extensive revisions of A.F.S. bookkeeping procedures, in order to simplify and standardize them in accordance with modern accounting practice. Mr. Horlebein reported on his recent visits to the British Columbia, Northern California, Oregon, Southern California and Washington chapters, where he urged Western chapters to play a more active role in activities of the Society. As a result of his trip, Mr. Horlebein said, West Coast chapters will hold consecutive meeting dates, beginning in the fall of 1950, so that speakers from the East will be able to address West Coast chapters in minimum time. In addition, he said, tentative plans were developed for a Pacific Northwest Regional Conference in 1950.

Schedule New A.F.S. Publications

A report of the Publications Committee was presented at the Executive Committee meeting. The report stated that a heavy schedule of new and revised publications has been approved for the coming year and that the Publications Committee will work closely with the National Office in development of this literature. The Committee expressed a desire that steps be taken to provide more good editorial content in AMERICAN FOUNDRYMAN in view of the widespread acceptance of the magazine and the number of unsolicited manuscripts being received. Among its recommendations, the Committee urged preparation of a simplified booklet on foundry indoctrination for beginning employees —a booklet which would contain pertinent facts on the industry and its operations.

Concluding the Executive Committee meeting was a report by A.F.S. Gray Iron Division Chairman R. G. McElwee, Vanadium Corp. of America, Detroit, on work of the Cupola Research Committee. The Cupola Research Committee has developed definite recommendations concerning air pollution from cupola operation, Mr. McElwee said, and these results will be published shortly in AMERICAN FOUNDRYMAN.

Meeting September 13 at the Hotel Statler, Buffalo, the A.F.S. Sand Division's Flowability Committee reviewed its recent work in devising a more reliable method of measuring flowability and made plans for further study of the problem. Members attending were Chairman D. F. Sawtelle, Malleable Iron Fittings Co., Brantford, Conn; F. P. Goettmann, Duriron Co., Inc., Dayton, Ohio; N. H. Keyser, Battelle Memorial Institute, Columbus, Ohio; W. G. Parker, Elmira Foundry Co., Elmira, N. Y.; and Jos. E. Foster, A.F.S. National Office, Chicago.

Mr. Goettmann suggested that a thorough survey be made of flowability literature before the committee embarks on experimental work. Mr. Parker described flowability apparatus he has designed and built and which is now at Malleable Iron Fittings Co., Brantford, Conn., and is available to any committee member wishing to use it.

Among other recommendations made by the committee were that members be appointed to review trade and technical literature on flowability and abstract information from pertinent articles. It was also suggested that the problem of flowability be used as a university project for a master's thesis.

Cupola Research Committee

The A.F.S. Cupola Research Committee met at the Rackham Memorial, Detroit, September 29, to review its work to date and to formulate plans for future research into cupola problems, and to re-elect its officers for the coming year. Members attending were Chairman R. G. McElwee, Vanadium Corp. of America, Detroit; Vice-Chairman A. E. Schuh, U. S. Pipe & Foundry Co., Birmingham, Ala.; Secretary E. H. Stillwill, Dodge Div., Chrysler Corp., Detroit; A. L. Boegehold, General Motors Research Laboratories, Detroit; C. F. Joseph, Central Foundry Div., GMC, Saginaw, Mich.; and W. B. McFerrin, Electro Metallurgical Div., Union Carbide & Carbon Corp., Detroit. Also present were A.F.S. Technical Director S. C. Massari and Thaddeus Giszczak, A.F.S. research metallurgist for the project.

It was decided by the committee that an annual progress report will be prepared and available by February 15 for subsequent presentation at the A.F.S. Convention, March 8-12, 1950, and publication in A.F.S. TRANSACTIONS.

Allis-Chalmers Mfg. Co., Milwaukee, Mr. McElwee said, will conduct cupola coke experiments utilizing coke supplied by the Ford Motor Co., Dearborn, Mich. Initial experiments will use four cars of coke, each made under a different coking cycle, but of identical coal mixtures.

It was decided that A.F.S. Research Metallurgist Thaddeus Giszczak undertake integration and revision of the A.F.S. HANDBOOK OF CUPOLA OPERATION, in order to expedite publication of a revised edition, and

that a chapter will be included in the Handbook on cupola dust and fume control.

It was further decided by the committee that a campaign be started not later than December 1 to raise funds for continuing cupola research work. Also approved was a recommendation that articles on the following be prepared for publication in AMERICAN FOUNDRYMAN: (1) How to install a bottom in a cupola, (2) Method of taking a heat log, to include the importance of chemistry control, chill control and Brinell hardness, (3) A report on oxygen enriched cupola blast tests conducted at the Chevrolet Gray Iron Foundry, Flint, and (4) A review of hot blast practice as conducted in Europe.

Nominating Committee Replacement

Martin W. Pohlman, vice-president, Pohlman Foundry Co., Buffalo, N. Y., and treasurer of the Western New York Chapter, has replaced Martin J. O'Brien, works manager, Symington-Gould Corp., on the Nominating Committee. The 1950-51 slate of officers and directors selected in Chicago by the committee December 9 will be announced soon.

Meeting November 1 at the University of Michigan, where its research project is under way, the A.F.S. Malleable Research Committee heard a progress report on the research project and made recommendations for proposed Malleable Division projects. Present at the meeting were Chairman Carl F. Joseph, Central Foundry Div., GMC, Saginaw, Mich.; H. Bornstein, Deere & Co., Moline, Ill.; W. A. Kennedy, Grinnell Co., Inc., Providence, R. I.; James H. Lansing, Malleable Founders' Society, Cleveland; C. F. Lauenstein, Link-Belt Co., Indianapolis; Richard Schneidewind, University of Michigan; Milton Tilley, National Malleable & Steel Castings Co., Cleveland; F. B. Rote, W. P. Wood and S. H. Bush, all of the University of Michigan; and S. C. Massari, A.F.S. Technical Director.

Reports On Malleable Research

S. H. Bush, University of Michigan research fellow, reported that tests have been run on nine complete series of test bars, and submitted a condensed, written report of results obtained, which was thoroughly discussed by the committee. Actual experimental work remaining, Mr. Bush said, involves finishing tests on approximately 300 bars utilizing induction heating at high frequencies.

The final report is to be sent to each member of the committee in January. Members are to review the report and at the next meeting either approve it in its entirety or submit constructive recommendations for its modification. Results will then be prepared for presentation at the 1950 A.F.S. Foundry Congress and Show.

In considering a new Malleable Division Research Project for the coming year, committee members suggested the following tentative projects:

(1) Determination of the value of boron in the production of malleable iron.

(2) Research on the effect of furnace atmospheres in the annealing cycle.

(3) A study of what controls carbon nuclei.

(4) Ascertainment of the values to be derived through use of a basic lined cupola.

(5) A study of the deoxidation of malleable iron prior to pouring.

(6) A study of melting furnace atmosphere and its relation to both the chilling characteristics of iron and the annealing cycle.

(7) A study of the effect of superheat and time at temperature during melting, and their influence on metal behavior during annealing.

These proposed projects, as well as additional ones, are to be discussed at the committee's meeting in January, when one of the projects will be selected.

Light Metals Committee Meets

Members of the Aluminum & Magnesium Division's Executive Committee, meeting October 3 at A.F.S. Headquarters, Chicago, heard reports on various Division committee activities and made plans for the Aluminum & Magnesium Division's program at the 1950 A.F.S. Foundry Congress and Show, and for research work during the coming year.

Members attending were Chairman W. E. Sicha, Aluminum Co. of America, Cleveland; Walter Bonsack, Apex Smelting Co., Cleveland; M. E. Brooks, Dow Chemical Co., Midland, Mich.; Hiram Brown, Solar Aircraft Co., Des Moines; W. J. Klayer, Aluminum Industries, Inc., Cincinnati; C. E. Nelson, Dow Chemical Co., Midland, Mich.; H. J. Rowe, Aluminum Co. of America, Cleveland; R. F. Thomson, International Nickel Co., Detroit; R. E. Ward, Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J.; and A.F.S. Technical Director S. C. Massari.

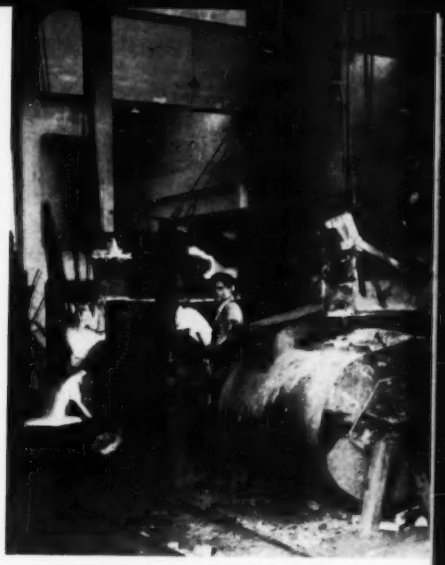
During the meeting, it was learned that David Basch, Almin, Ltd., of Great Britain, Schenectady, N. Y., died October 2. Mr. Basch had been prominent in A.F.S. Aluminum & Magnesium Division committee work for many years and at the time of his death was chairman of the Committee on Centrifugal Casting, and the Committee on Test Bars, and was a member of the Executive, Alloy Recommendation, Die Castings and Sand Castings committees of the Division. He is succeeded as chairman of the Test Bars Committee by Division Chairman Walter Bonsack and as chairman of the Centrifugal Casting Committee by Dr. Blake N. Loring, U. S. Naval Research Laboratory, Washington, D. C.

At the Aluminum & Magnesium Executive Committee's meeting it was announced that several papers had already been received and several were in preparation for presentation at the 1950 A.F.S. Foundry Congress and Show. The feasibility of recording discussions at round table meetings during the Convention was discussed and was voted against since recording limits the free flow of discussion.

(Continued on page 60)

THE FOUNDRY INDUSTRY IN Argentina

Macedonio Z. Lopez
Chief, Production Division
La Cantabrica
Buenos Aires, Argentina



Cupola operating with mixer in Argentine foundry.

ORIGIN OF THE FOUNDRY INDUSTRY in Argentina is lost to history but it is believed that the art of casting metals dates back to the ancient Incas, whose descendants are today skilled workers in precious metals. Primitive implements of cast iron, predating the colonization of Argentina in the Sixteenth Century by the Jesuit fathers of Spain, have been found in the province of Tucuman.

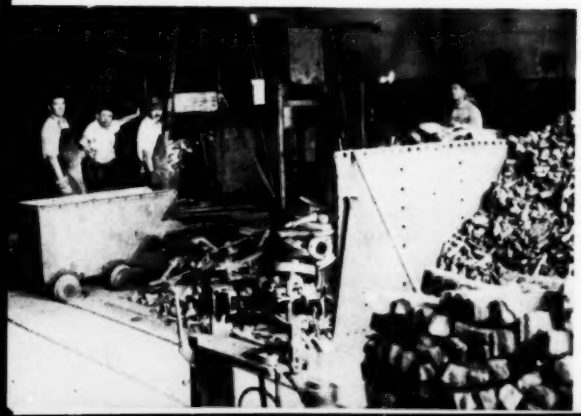
The necessity for arms and munitions to further the cause of Argentine independence gave birth to the foundry industry of today. Paradoxically, the first gunfounder was a priest, Fray Luis Beltran.

In 1860, with the advent of the railroad in Argentina, the castings industry assumed a role of major importance in the country's economy and the foundry industry was centered in the railroad's three terminal cities—Buenos Aires, Rosario and Cordoba.

Until the time of World War I, gray iron castings formed the basis for the country's agricultural implement manufacturing industry, but were largely superseded by malleable castings introduced at that time. The supremacy of the malleable foundry in making agricultural implements was short-lived, however, for the Argentine malleable founders were unable to compete with lower-priced castings from European countries. Today, the malleable iron industry has had a rebirth because of the need for replacement parts for farm machinery from the United States.

The growth of the Argentine foundry industry was under the supervision of first the Spanish, then the French, and lastly the English, until 10 years ago, when an Argentine railroad trade commission brought in molding machines and new foundry methods from the United States.

Today, the foundry industry of Argentina exists solely as an emergency producer of castings—to meet military needs or to furnish replacement parts for foreign-made machinery. The two major causes for the retarded development of the country's foundry industry are the absence of raw materials at reasonable prices and the lack of skilled labor.



Charging and weighing a skip on narrow gage track.

Import Pig Iron, Alloys

During the early years of iron founding in Argentina, pig iron was imported from England. Following World War I, pig iron from Luxembourg was used extensively, and from 1930 to 1939, it was imported from several European nations. Since 1939 Chile and Brazil have been the principal sources of pig iron.

With respect to coke, conditions are better. There are several coal fields located in the Andes mountains and along the Patagonian border. The Argentine Navy recently completed exploration of new coal fields and the first consignment arrived only recently from these fields.

Argentina produces no alloys. All that are used (ferrosilicon, ferromanganese, ferrochromium, nickel, etc.) are imported. The steel industry is most affected by this shortage because of its large use of ferromanganese and ferrosilicon and in some steel foundries manganese ore is used directly from the mines, without treatment. The country has a few hard-to-reach deposits of manganese, but it has been found to be more practical to import this mineral.

Argentina has a plentiful supply of good woods for patternmaking. These woods are harder than Canadian pine, previously imported because of its ease in working, but they are durable and show little distortion. They are well suited to the construction of coreboxes, matchplate patterns and flasks.

The country is well provided with molding sands of many types, from 20 to 97 per cent silica, and many of these sands, because of their natural binding materials, can be used directly from the banks.

The reasons why many sands are neglected simply because they require synthetic binders are that the use of bentonite is known only to a few Argentine foundrymen. It is costly, and there is an absence of machinery and equipment for synthetic sand preparation.

The lack of high-temperature molding sands has had a profound effect on the steel casting industry. Virtually all Argentine steel foundries use crushed quartz at exorbitant prices. This crushed quartz is bonded with molasses or sweet potatoes rotted under water. Use of this high-priced crushed quartz has made green molding of steel almost unknown in Argentina and has made steel castings very costly.

Sands for coremaking are mixed with such binders as linseed oil, resin, and wheat flour. Bentonite is rarely used. One of the sands used for green molding requires no binders. When used for dry molding, it is a common practice to add only red clay to the sand.

The core wash in most common usage in Argentina is plumbago, imported from Italy and Madagascar.

Washes are generally made up of water in which horse manure has been allowed to ferment, which is then filtered and plumbago added. The fermentation of the manure produces ammonia, which dissolves greases in the manure, resulting in an excellent vehicle.

Lack Skilled Foundry Labor

One of the greatest drawbacks to the advancement of the castings industry in Argentina is the lack of skilled foundry labor. Labor in Argentina has always been preponderately agricultural, and the transition of farmers to metal industry workers is necessarily a slow one. Within the last few years, industrial training schools have been established but their effects have not as yet been far-reaching.

Although the war speeded up foundry production considerably and was responsible for an influx of skilled labor from other countries, Argentina could not offer a technology sufficiently advanced for these highly-specialized workers and thus the country was unable to fully utilize their foundry skills.

Argentine foundrymen working with a large, batch-type oven capable of baking cores, molds overnight.

Although for many years Argentine foundry practices were derived from those of European countries, World War II disrupted contact with those countries and Argentina began to look to the United States for modern foundry technology.

Describes Argentine Foundry Equipment

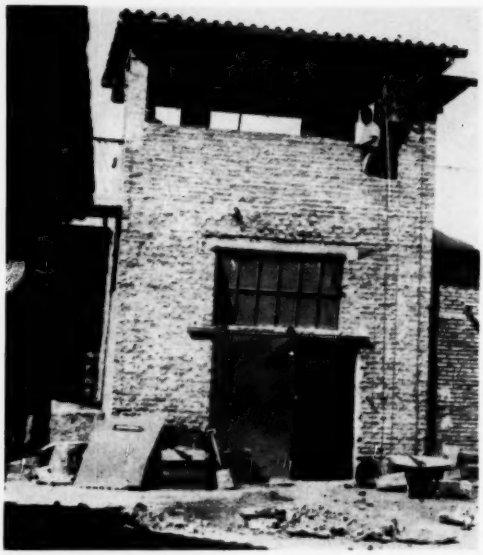
The following is a description of machines and equipment in use in Argentine foundries today:

Patterns: Wood patterns are in most common usage, together with some aluminum, brass or cast iron patternplates and matchplates. Four types of plates are used: (1) symmetrical—on which cope and drag are rammed on the same face of the plate; (2) single plate—on which only one face has pattern, because either cope or drag is plain; (3) double or reversible plate—on which cope is rammed on one face and drag on other; and (4) combined plate—on which each piece to be molded is made up on two plates—one for cope and one for drag.

Molding and Stripping Machines: molding machines are used only in four or five of the largest foundries, because it is cheaper in Argentina to mold by hand. A few foundries have simple stripping machines and vibrators. These stripping machines are used only to hold and draw the pattern plate and

At left: Molds ready for pouring without jackets. Sand rammed around molds prevents runouts. Right:

Argentine foundry workers removing castings from the pouring yard in manual shakeout operation.



Hand hoisting device raises cupola charges to charging door in this 100 per cent hand operated foundry.

ramming of sand is done by hand. In some foundries vibrators are used in addition to the stripping machines, but ordinarily patterns are loosed from the sand by light blows with a wooden hammer, because compressed air is not in common use.

The first complete molding machines used in Argentina were imported from France. All molding operations were done by the motion of hydraulic pistons, except for the turning out of the plate, which was done by hand.

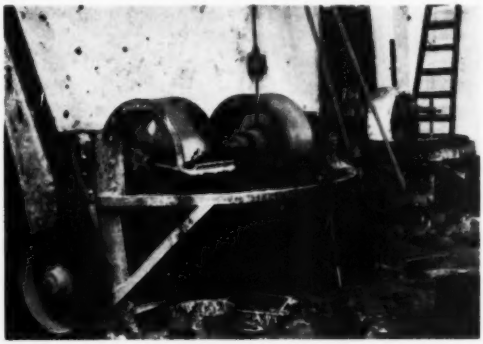
Electrically-operated jolt machines arrived in the country shortly after the advent of the hydraulic machines. In the beginning, these jolt machines were of obsolete types and were generally discredited. This, however, was not the fault of the machines but, again, was the fault of the poor molding sands used. Actually, the machines did a very good job when the quality of the sand was good. Molding machines from the United States have come into general usage since World War II.

Use U. S. Molding Machines

Today, Argentina, has U. S. molding machines of all types—jolt, jolt-squeeze, rockover, sandslinger, etc., but their use is limited to four or five large foundries. Some troubles have been encountered with the molding machines from the United States: (1) the buyers of the machines neglected to purchase necessary complementary equipment, which must be especially adapted to the machines; (2) all existing pattern plates in Argentine foundries cannot be adapted to these machines; (3) few foundries, with the exception of the very largest, have compressed air installations, and prospective purchasers of these machines dislike investing in compressed air equipment because of the high cost of installation; and (4) very few Argentine foundrymen understand the operation of these machines, and thus their efficiency is doubted.

Coremaking in Argentina is largely done by hand and coremaking machines are virtually unknown. Core boxes are made from hard wood or aluminum, commonly of hard wood. The principal reason for not using core blowing machines is that few Argentine foundrymen understand the construction of core boxes for the machines, particularly with respect to the venting of the boxes. The foundrymen think that the specially-vented core boxes required are too expensive for the limited production of Argentine foundries. Another difficulty is the lack of compressed air facilities in most foundries.

All cores are used dry, and never used green. Shell-



This sand mixer, with its fixed rollers and rotating pan is an adaptation of the old Chilean mill.

type ovens, burning wood or coal, are used for drying small cores. For the larger cores, the same oven is used as that for dry sand molds. Argentine foundries do not place major emphasis upon cores. Usually the core department is operated by apprentices, with a foreman in charge.

Apparatus for the control of sand in the foundry was unknown in Argentina until 1941, when some equipment was installed in a Navy foundry. The author's foundry purchased a drier, permeability meter, ramming device and compression strength tester from a firm in the United States shortly afterward. This was, at the time, the most complete sand control laboratory in Argentina.

Generally speaking, all the foundries of Argentina with the exception of the very largest, are without sand preparation equipment—using only wire screens, shovels, hoses, and buckets.

One of the country's first sand preparation machines was installed about 1930 and consisted of a vibrating wire screen, a bucket elevator, a centrifugal disintegrator, a moisture device, and a discharge channel. Although the unit had no flask shakeout or magnetic separator, it worked very well. The shop in which the unit was installed, however, did not have materials handling equipment for the sand, and all transporting had to be done either with handcarts or buckets attached to a travelling crane.

Later, a few foundries installed some sand preparation equipment, but this consisted largely of odd pieces such as vibrating screens, rolling mixers, and portable centrifuges and aerators until 1945, when the first and probably the only continuously operating foundry in Argentina was built.

Constantly increasing labor costs are making Argentine founders mechanization conscious, but there are several reasons that stand in the way of foundry modernization:

(1) Uncertainty as to the future of the country's foundry market and a resulting reluctance on the part of foundry management to invest heavily in new equipment.

(2) Existing buildings will have to be completely remodeled to accommodate mechanized equipment.

(3) A scarcity of supervisors and foremen capable of handling mechanized foundry work exists throughout Argentina.

(4) Need for complete revamping of all foundry

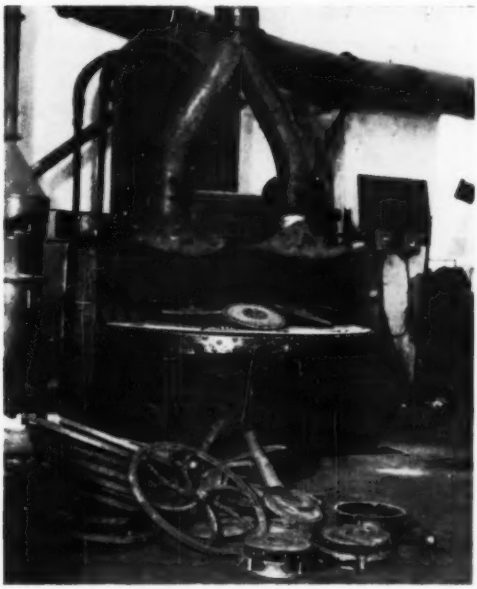


Table of rotating foundry sand blasting machine.

departments and for recoordinating them.

(5) Management lacks specific knowledge of mechanized equipment and its applications.

(6) A scarcity of foreign credits for the purchase of such equipment.

(7) Installation of mechanized equipment would necessitate interruption of foundry production.

In typical Argentine sand practice the sand arrives at the foundry without any preparation (synthetic sands are rarely used and only for cores or in steel molding) and is spread in an eight-inch layer on the floor. The molder then takes the sand, makes his mold, and places the mold on the same floor, where it remains until poured—sometimes as long as three days. The poured molds are then broken on the same floor, the sand is washed down with a hose, screened and returned to the original sand pile for re-use.

In this process, two conditions often arise—(1) the volume of sand decreases because of the burned sand sticking to the castings, and (2) the sand's physical properties are so exhausted that it becomes almost impossible to mold, unless so much water is added that the sand becomes mud.

In either case, the solution has been to spread new sand on the bed of old sand, but since this cannot be done indefinitely, it is necessary to throw out the old sand from time to time. There is no recovery of core sand. In some foundries, when the sand becomes weak, bentonite is added by spreading it with a shovel just before the sand is screened.

Cupolas In Extensive Use

In general, cupolas in Argentina are similar to those used in the United States, but are smaller. The cupola in most common usage melts from 2000 to 3000 lb per hour. Some of the larger foundries have cupolas melting 10,000 lb per hour. In the province of Tucuman, where large castings for sugar mills are produced, even the very smallest foundries have 10,000 lb cupolas.

All gray iron foundries in Argentina, without exception, use the cupola, and about three of them have reverbratory furnaces.

Even the malleable iron foundries use the cupola because all malleable iron made is the European or white heart variety.

Cupola control devices are not in widespread use in Argentina, consisting principally of scales for weighing the charges. Such controls as scrap selection, combustion-air control, etc., are used only in one foundry.

Gray iron and malleable foundries use only the cupola, but the steel foundries use several types of furnaces, principally arc, Bessemer and open hearth. Of these, the most commonly used is the three-phase, direct-arc electric furnace. Five years ago, the largest of these had an hourly melting capacity of five tons. There may be larger electric furnaces in Argentina today, but none exceeds 10 tons. Almost all these

Stand grinders of this type are customarily used for finishing small castings in Argentine foundries.

Forced-draft portable ovens of this type are commonly used in Argentina for drying large floor molds.

furnaces are charged with scrap and very few are used with cupolas in duplexing operations.

Bessemer converters were widely used years ago, then declined in popularity, but today the use of these converters is again becoming widespread in Argentina. These converters are small, averaging one to three tons, with none exceeding 10 tons.

Argentina's steel foundries are mainly engaged in producing large castings. The reason for this is that the ladles used are not adapted to the pouring of small castings, and if the molten metal is transferred to a smaller ladle, it becomes too cold. Those steel foundries devoted entirely to castings as a rule use electric furnaces and Bessemer converters.

Foundry Transport Is Primitive

The majority of Argentine foundries have only the handcart as a means of transport, but a few of the larger foundries have installed travelling cranes for pouring large castings. The pouring yards for small castings are served by hand labor. As many as six men are required to carry one ladle of molten metal. A very few foundries have monorails for pouring, while still others have a "decauville," a narrow gauge track used for all types of foundry transport, but the pouring operation itself is by hand ladle. Castings weighing up to 200 lb are poured by hand; larger ones are poured by crane.

Although most cupolas are charged by hand, perhaps eight foundries have mechanical chargers. A few others elevate the material to the charging platform with an electric hoist. From the platform to the cupola the material is handled by shovel.

Two types of flask are in common usage—the so-called "permanent type" made of cast iron, and the "detachable," which is dismantled when the mold is finished. The detachable flasks are generally made of aluminum or of wood. Jackets are seldom used.

With the exception of a few home-made chaplets for holding large cores, they are virtually unknown to Argentine foundrymen. The few chaplets used are not mass produced and are very expensive. The same situation exists in regard to chilling plates. Chills are used in Argentina only when a casting needs a hard surface—never to avoid shrinkage or cracks.

Cleaning, trimming and chipping operations are with few exceptions done by hand. Some of the larger foundries employ sandblasting machines but do not use steel shot. The sandblast machine in most general use is of the rotating table type. This machine does not require the use of a special room or other protection for the operator. Large castings are cleaned by hand or sandblasted in a special room. To my knowledge, sandblasting of castings has not proved practical in Argentina. A mechanical shot blast was recently installed in one of the foundries with excellent results, particularly in the cleaning of steel castings.

Only steel and malleable castings are heat treated. Some steel castings are used without annealing and some are annealed when machining is too difficult. These steel castings are annealed in oil-fired car bottom furnaces.

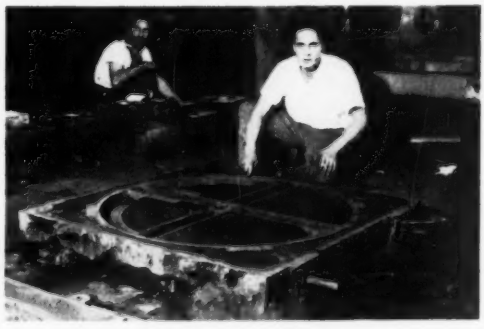
Malleabilizing of white heart iron is done widely in oil-fired pit furnaces. The castings are placed in cast iron boxes containing iron oxide. Castings must be carefully distributed to avoid distortion and must be kept away from the walls of the box to avoid high temperatures.

Cost Control Methods

Until a few years ago, clerical work in the foundry was considered unimportant. Today, offices have been greatly enlarged and the clerical staffs work directly under the foundry managers, who are responsible for all production. Delay in delivery is common but this situation could be remedied if foundries were put on a continuous production basis. One cause of disorganization is the practice of accepting orders that are beyond the plant's capacity. Inspection of castings is almost unknown.

Argentine foundries usually refer to their output in terms of tons per month. This is variable because castings range in weight from about half a pound to over 600 pounds. Some foundries whose output is confined to a few customers have reduced the diversity of their castings and are consequently highly organized, as are those that are part of larger firms.

Costs are determined monthly in order to establish the cost per kilogram (2.2 lb) of each category of castings. In some organizations the system requires a stockpile of castings, which are delivered directly to the customer, greatly simplifying the problem of cost determination. Furthermore, this system provides a means of determining basic values for rapid quotations to the customer.



Working on the cope of a medium-sized floor mold.

UPSTATE NEW YORK CHAPTERS HOLD FIRST REGIONAL MEETING

UPPER NEW YORK STATE FOUNDRYMEN held their first regional foundry conference November 25 and 26 when 267 attended a series of meetings in Syracuse. Sponsors were the Central New York, Eastern New York, Western New York, and Rochester Chapters of A.F.S. and the college of applied science of Syracuse University where the sessions were held. General chairman of the conference was E. E. Hook, Dayton Oil Co., Syracuse; the program was arranged under the direction of National Director L. D. Wright, U. S. Radiator Corp., Geneva, and Martin J. O'Brien, Symington Gould Corp., Depew, N. Y.

National President E. W. Horlebein greeted conference attendants on behalf of the national officers, directors, and staff and mentioned plans for the 1950 A.F.S. Convention and Show—May 8-12, Cleveland—

Under the direction of Drs. B. J. Lazan and F. R. Morral, Syracuse University materials engineering staff members tested gray iron and nodular iron specimens, the latter as-cast, annealed, and normalized, in tension and torsion and prepared photomicrographs and stress-strain curves. Shown making a tensile test is G. J. Monagle. Photographs are by Robert G. King, Oberdorfer Foundries, Syracuse, photographer for the Central New York Chapter.

at the opening session following a greeting from the host chapter expressed by J. F. Livingston, Crouse-Hinds Co., Syracuse, chairman of the Central New York Chapter. F. Gordon Smith, executive secretary of Syracuse University, spoke for the school.

Preceding the opening of the conference a testing demonstration, under the direction of B. J. Lazan and F. R. Morral, professors of materials engineering, illustrated testing procedures and brought out characteristic properties of gray and nodular irons.

First technical speaker was J. C. H. Stearns, Dow Chemical Co., Midland, Mich., who discussed some of the latest developments in nodular iron. He showed electron micrographs of flake graphite, temper carbon, and nodules, and showed that cerium gives the same type of nodule as magnesium. Also brought out were the difference between the compactness of the nodule and the diffuse structure of the temper carbon.

Mr. Stearns discussed the apparent nucleus of the nodules, preferred compositions for the iron, and pointed out that titanium must be below 0.15 per cent to avoid erratic results. Pure magnesium and magnesium vapor can be used to nodulize iron.

To make nodular iron consistently, the foundryman will have to know fairly accurately a number of things, among them the exact base iron analysis, said Mr. Stearns. Made right and used right, nodular iron has great possibilities, declared the speaker, and he warned against poor or nonuniform quality, or incorrect use, which might cause customer fear of the new material.

Dr. Lazan discussed the results of the tests performed earlier in the morning and the significance of mechanical tests in general. Dr. Morral summarized the properties, costs, treatments, and foundry behavior of nodular iron as found in the literature and distributed a bibliography of American and foreign literature.

During the discussion period the speakers and the following panel answered questions from the audience: W. F. Morton, Anstice Corp., Rochester; George Hochsgang, Straight Line Engine Co., Syracuse; J. W. Clifford, Bison Casting Co., Buffalo; K. F. Echard, Eddy Valve Co., Waterford, and Gilbert L. Cox, International Nickel Co., Rochester, N. Y. Frank C. Wheeler, Kimman & Wheeler Co., Syracuse, was chairman of the session.

R. E. Montonna, director of the university's institute of industrial research, spoke at the luncheon the first day. Presiding was Martin J. O'Brien. Industrial research is a form of insurance, declared Dr. Montonna, that keeps a business abreast of the times and prevents it from going under.

At the general session following luncheon, J. H. Lansing, Malleable Founders' Society, Cleveland, outlined the uses and advantages of malleable cast iron. Briefly reviewing the history of blackheart malleable iron he cited the increased use and improvement in

Conference participants photographed at the banquet are (left to right) John A. Feola, Crouse-Hinds Co., Syracuse, conference publicity chairman; National Director L. D. Wright, U. S. Radiator Co., Geneva; program chairman; J. C. H. Stearns, Dow Chemical Co., Midland, Mich., who spoke on nodular iron at the first technical session; E. E. Hook, Dayton Oil Co., Syracuse, general chairman; J. F. Livingston, Crouse-Hinds Co., conference secretary and Central New York Chapter chairman; and President Horlebein.

quality, bringing his listeners up to the present with a showing of the MFS movie *"This Moving World."*

The session, with Henry P. Blumenauer, Jr., Albany Castings Co., Voorhesville, N. Y., presiding, ended in a question and answer period during which the speaker and the following provided the answers: Carl Webber, Frazer & Jones Co., Syracuse; Ralph T. Rycroft, Kencroft Malleable Co., Inc., Buffalo; and John C. Goetz, Acme Steel & Malleable Iron Works, Buffalo, N. Y.

First day's technical activities concluded with two simultaneous sessions on non-ferrous and on steel foundry practice. Walter E. Sicha, Aluminum Company of America, Cleveland, spoke on *"Postwar Developments in the Aluminum Foundry,"* at the non-ferrous meeting; Leonard Greenfield, Samuel Greenfield Co., Buffalo, presided. At the steel session the speaker was William M. Ball, Jr., R. Lavin & Sons, Inc., Chicago, with Alfred A. Diebold, Atlas Steel Casting Co., Buffalo, presiding, and a panel consisting of Max T. Ganzauge, General Railway Signal Co., Rochester; J. Saunders, Tonawanda Electric Steel Casting Corp., North Tonawanda; and Chester L. Richards, Adirondack Foundries & Steel, Inc., Watervliet, N. Y.

Mr. Sicha outlined aluminum foundry developments occurring during and since the war, discussing such advances as induction baking of cores, use of more open sands, wider use of synthetic sands, and the trend toward smaller riser size. Riser size can be reduced, he said, by means of insulating materials, by use of exothermic materials, and by introducing heat from an external source.

Interest in gating improvements is shown, Mr. Sicha declared, by the number of films on the subject produced recently. The A.F.S. film, *"Fluid Flow in Transparent Molds"* (page 27), he said, portrays fundamentals of interest to all foundrymen. He concluded with a number of slides illustrating applications of aluminum castings and product development. Panel for the session consisted of the speaker, Prof. Scott MacKay, Rensselaer Polytechnic Institute, Troy; J. Francis Dobbs, New York Air Brake Co., Watertown; and Charles E. Vaughn, Ritter Co., Inc., Rochester, N. Y.

William M. Ball, Jr., R. Lavin & Sons, Chicago, discussing his conference talk with Alfred A. Diebold, Atlas Steel Casting Co., Buffalo, chairman of the session.

There is more than one right way to produce most steel castings, said Mr. Ball, in outlining possible uses of men, materials, and methods in foundry operation.

Sand is the number one tool of the foundryman according to Mr. Ball, who said that selection of proper type and care in storage are important. Testing and control of purchased sand should be standard practice, he declared, and the foundryman must insist on uniformity.

National President E. W. Horlebein again spoke at the conference dinner the evening of the first day. Held at the Onondaga Hotel in Syracuse, the meeting had as toastmaster National Director L. D. Wright who thanked technical speakers, meeting chairmen, and committee members for their participation in the conference. Dr. T. V. Smith, Syracuse University, was principal speaker.

Sand, engineering education, motion study, and a

tour of Syracuse University engineering departments were on the program for the second day. Talking on sand was Harry W. Dietert, Harry W. Dietert Co., Detroit. Honorary chairman was H. Ries, retired head of geology at Cornell University, and long the chairman of the A.F.S. Sand Division. D. C. Williams, industrial engineering professor of Ohio State University, presided; co-chairmen were W. G. Parker, Elmira Foundry Co., Elmira, and A. J. Murrer, Gleason Works, Rochester, N. Y.

Mr. Dietert called on foundrymen to become more quality conscious and said sand offers great possibilities for improving casting quality. He urged every foundry to assign at least one man to the study of the A.F.S. Sand Research reports and the other foundry literature on sands and cores.

Prof. B. H. Norem spoke on motion study and showed a film illustrating motion study principles. Presiding was Prof. E. Syrene, also of Syracuse University. Motion study, said Prof. Norem, is the analysis of movements of persons performing manual work and it is used to determine the best practical method for doing the work. Few operations in industry today, declared Norem, require the skill an experienced molder is expected to have.

Prof. P. E. Kyle, Cornell University, spoke at the luncheon meeting on training foundry engineers. Chairman was Kenneth R. Proud, Anstice Co., Inc., Rochester, N. Y. The speaker described how engineering college training can prepare a student for a foundry job by outlining the Cornell metallurgical engineering curriculum.

Regional conference officers were: *general chairman*, E. E. Hook, Dayton Oil Co., Syracuse; *secretary*, J. F. Livingston, Crouse-Hinds Co., Syracuse; and *treasurer*, Wm. D. Dunn, Oberdorfer Foundries, Syracuse.

A.F.S. National Director L. D. Wright, U. S. Radiator Co., Geneva, N. Y., was chairman of the Program Committee, with Martin J. O'Brien, Jr., Symington Gould Corp., Depew, N. Y., as co-chairman. Committee members were Kenneth R. Proud, Anstice Co., Inc., Rochester, and Jasper N. Wheeler, Wheeler Brothers Brass Foundries, Inc.; Troy, N. Y.

Chairman of the Arrangements Committee was E. G. White, Crouse-Hinds Co., Syracuse. Members were Bruce Artz, Pangborn Corp.; J. O. Ochsner, Crouse-Hinds Co., and Frank C. Wheeler, Kimman & Wheeler Co., all of Syracuse.

Publicity Committee chairman is John A. Feola, Crouse-Hinds Co., Syracuse. Members are Frank E. Bates, Semet-Solvay Div., Allied Chemical & Dye Corp., Buffalo; Leon C. Kimpal, Rochester Gas & Electric Corp.; and John M. Jones, American Locomotive Co., Schenectady.

Syracuse University faculty members participating in the Conference were Drs. R. E. Montonna, B. J. Lazan, and F. R. Morral, Dean Louis Mitchell, Prof. E. Syrene, and S. B. Schaffner.

Photo Highlights Of A.F.S. Michigan Regional Foundry Conference

Top, left: William T. Bean, Jr., foundry consultant, Detroit, graphically demonstrates principles of castings stress analysis at the October 28 session of the Michigan Regional Conference. Below: Seated, left to right, at the speakers' table at the Michigan Regional Foundry Conference dinner October 28 were: Frank Tatnall, Baldwin Locomotive Works, Philadelphia; V. A. Crosby, Climax Molybdenum Co., Detroit; Austen J. Smith, Michigan State College, East Lansing; Talbert Abrams, Abrams Aerial Survey Corp., Lansing, dinner speaker; C. C. Sigerfoos, Michigan State College; L. C. Price, Michigan State College; Richard Scheidewind, University of Michigan; Thaddeus Giszczak, A.F.S. Cupola Research Project; and President Edwin W. Horlebein.

MODERN FOUNDRY METHODS...

DEVELOP PLASTER MOLD CASTING PROCESS

Applications of the plaster mold casting process, as developed by Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J., have made possible the casting of complicated cylindrical shapes on a production basis to tolerances within plus or minus 0.005 in.

In preparation for the casting of a one-piece, high-speed shrouded impeller by the Bendix technique of plaster mold casting, specially compounded plaster is scientifically mixed on an automatic agitator. Thorough mixing of the ingredients, performed under a vacuum to exclude the possibility of air bubbles, insures the satin-smooth inner sur-

Exact quantities of plaster are mixed under vacuum to remove all air bubbles from the mixture.

When set the plaster casting is removed from the mold.

The plaster injection cylinder is attached to the inverted mold.

faces and thin uniform walls so important in the fabrication of an intricately designed high-speed impeller.

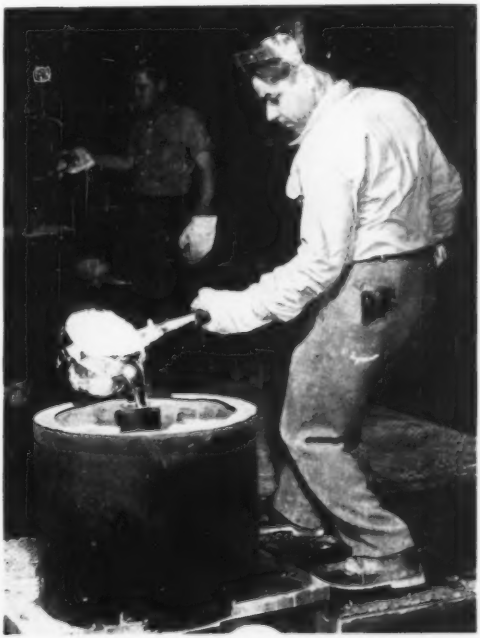
After the expendable vanes have been positioned in the permanent mold, the latter is inverted and the plaster injection cylinder attached to the mouth of the mold. With the mold still inverted, a piston forces the plaster from the cylinder up into the mold evenly and without the danger of bubbles which might result from a gravity pour.

When the plaster has set the cover is lifted off. A threaded pilot shaft helps to loosen the plaster casting from the mold.

The vanes, which served as cores, are removed; flash marks and fillets are cleaned by hand (right) and sharp edges rounded off to complete the plaster core.

After both the core and the permanent mold have been preheated to a specified temperature, they are assembled and prepared for pouring (below, left). Speed and deftness of handling are required in this step to prevent any detrimental loss of heat prior to pouring.

On a spinning turntable molten metal is poured (below, right) into



MODERN FOUNDRY METHODS...

the new mold, where centrifugal force distributes it evenly. Because the rate of flow is an extremely important factor, a restricted orifice meters the metal as it enters the mouth of the mold.

After pouring the permanent mold is removed from the turntable and disassembled. The photograph (above) shows the rough casting containing the plaster core ready for removal from the mold.

Removal of the plaster core from the final casting is accomplished by the use of high-pressure water jets (above, right).

The completed casting, a shrouded, high-speed impeller, with an intricate web of internal vanes, is critically examined (below) for adherence to dimensional specifications and uniformity of mass and shape. The plaster mold casting process, as applied in this foundry, holds tolerances as close as 0.005 in. and produces satin-smooth surfaces wherever desired, thus reducing machining required to finish the casting.

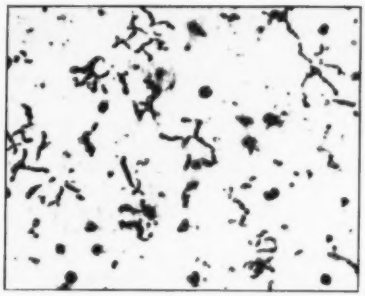


Fig. 1—Bar A. Unetched. X100.

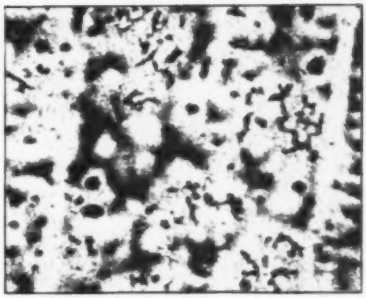


Fig. 2—Bar A. Nital etch. X100.

EXPERIMENTS IN NODULAR IRON

E. K. Smith
Consulting Metallurgist
Los Angeles

FOUNDRYMEN ARE FAMILIAR with the fact that gray cast iron is a soft, fairly strong, readily machinable material, and that its microstructure is broken up by countless flakes of graphitic carbon which have very little strength and, in fact, cause "notch effects" which make gray iron slightly brittle under impact.

It is equally well known that steel castings are ductile and tough, and that they contain no graphite. Malleable cast iron has a white fracture as cast but a long anneal causes graphite to separate from the partly plastic metal in nodules of temper carbon. Now foundry men have a new material—nodular iron—for castings designers and users, and a new process, both of which are in constant state of development.

The object of the present experiments was to make nodular iron using commercial metal in regular production, both from the electric furnace and cupola. It was thought that it might be useful to report some of the difficulties, as well as the successful results.

Electric Furnace Iron

Preliminary experiments demonstrated the suitability of a low-sulphur, low-phosphorus cast iron, melted in an acid lined arc furnace, and this was used for most of the trial runs. Analyses were quite uniform, the average being:

	per cent		per cent
Carbon	3.00	Silicon	2.20
Manganese	0.75	Chromium	0.26
Sulphur	0.035	Molybdenum	0.68
Phosphorus	0.040		

The chromium and molybdenum in no way inhibited the effect of magnesium; in fact, they appeared to have a decidedly beneficial effect. In most of the experiments an alloy of 50 per cent magnesium-50 per cent copper was used, as this alloy was less violent in its action than pure magnesium. The alloy was broken into lumps about egg size. The ladle of iron was covered by a steel plate, leaving an opening just large enough for dropping in the lump alloy. The lumps were added one at a time, in order to let the action quiet down between additions. Magnesium boils at 2030 F, and its reaction with molten iron is almost explosive. Obviously, the eyes and hands of those making the alloy additions must be protected.

In an effort to obtain better recovery of magnesium, the copper alloy was wired to a steel rod and thrust to the bottom of the ladle of iron. This boiled the metal rather violently, but did not improve recoveries. The addition of pure stick magnesium also produced a violent reaction, with no better recovery. Using the magnesium-copper alloy, recoveries of magnesium, as determined by spectroscopic methods, ranged from 3½ to 10 per cent. Obviously, allowing magnesium to burn on top of molten iron is an inefficient method for alloying the iron, and better methods are being developed. However, even this crude method can produce excellent nodular iron at not too high cost.

As soon as all the alloy had been added, the iron was

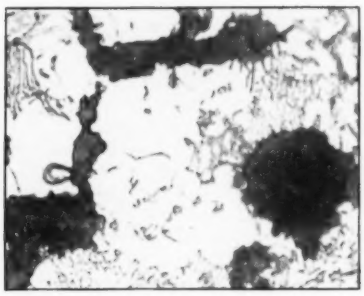


Fig. 3—Bar A. Nital etch. X1000.

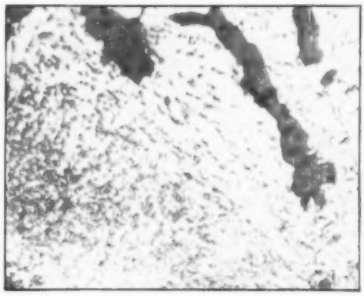


Fig. 4—Bar A. Nital etch. X1000.

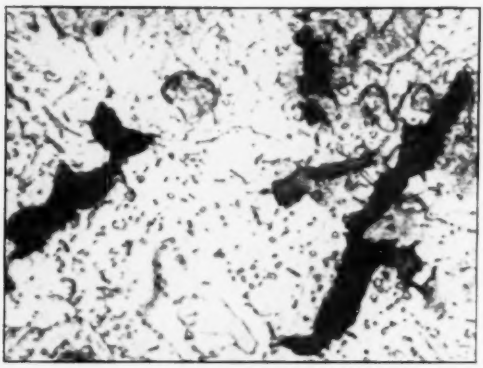


Fig. 5—Bar A. Nital etch. X1000.

thoroughly stirred and skimmed, and then 0.40 per cent silicon was added as 85 per cent ferrosilicon. The metal was then hot (about 2700 F) and quiet.

The usual ASTM "B" bars were poured at first, and the broken ends of the transverse test bars were machined for the tensile tests. However, the tensile results were slightly erratic, due to center porosity. This was corrected by machining tensile bars out of the conventional keel blocks. Test results on a typical set of bars are shown in Table 1. All results, physical and microscopic, are on the as-cast condition, as it was considered better to avoid the necessity for heat treatments.

Excellent effects had been obtained with 1 per cent magnesium additions, and this amount was used in all of the present experiments. However, as the technique in making additions improved, recovery of magnesium improved.

Figure 1 shows the graphite structure of Bar A. About half of the graphite is in nodular and spheroidal form, while the remainder is intermediate between Morrogh's quasi-flakes and true nodules.

The general structure of Bar A at 100X, etched, is shown in Fig. 2. Both the spheroidal and the nodular, or quasi-flake graphite, are in a semiferritic background, and the dendritic pattern is quite pronounced.

TABLE 1—PROPERTIES OF MAGNESIUM-TREATED ELECTRIC FURNACE IRON—BAR A

Transverse Test	
Nominal diameter, in.	1.20
Actual diameter, in.	1.192
Load, lb.	8200
Load (corrected), lb.	8370
Deflection, in.	0.404
Deflection (corrected), in.	0.401
Span, in.	12*
Tensile Test	
(machined from transverse test bar)	
Area, sq. in.	0.500
Load, lb.	41,100
Tensile strength, psi	82,200
(machined from keel block)	
Area, sq. in.	0.200
Load, lb.	19,900
Tensile strength, psi	99,500
Elongation, % in 2 in.	6.5
Reduction of area, %	4.5
Brinell hardness	248

* Note: 12-in span—not 18 in.

In Fig. 3 is illustrated the true nodular structure of the graphite in Bar A. Considerable ferrite is present, the remainder being remnants of lamellar pearlite.

Figure 4 shows another step in the breaking up of the pearlite. Traces of the lamellar pattern still persist, but most of the carbides are in very small spheroidized form. It will be noted that a number of these carbide particles are growing onto the graphite, forming more graphite, and ferrite. Figure 5 shows the spheroidized carbides almost gone, with outlines of ferritic grains appearing.

An examination of the structures of Bar A (Figs. 1 to 5) reveals why this iron casting tested 99,500 psi tensile strength and 6.5 per cent elongation as-cast. It is customary to credit the high strength of nodular castings to the graphite form, but it seems possible that some very small carbides of the new alloying agents might have a contributory effect.

Bar B Series

The physical properties, as shown in the series of which Bar A is typical, were considered very satisfactory, and it was decided to run additional tests, with the idea of improving the technique of making the magnesium additions. The alloy was more carefully

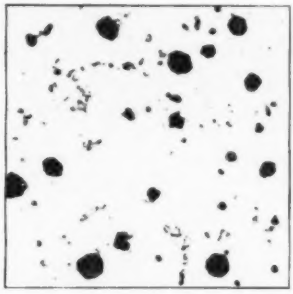


Fig. 6—Bar B. Unetched. X100.

sized, the remaining particles of magnesium were stirred into the iron for a longer time, and the metal was skimmed cleaner. The interesting point about the resulting metal was its increased strength and changed microstructure. One per cent magnesium as magnesium-copper was again used.

PHYSICAL TESTS ON BAR B

Area, sq. in.	0.196
Load (yield) lb.	15,680
Yield strength, psi	80,000
Tensile load, lb.	21,400
Tensile strength, psi	109,180
Elongation in 2 in., %	2.5

Magnesium was not determined on Bar B, but ran 0.12 per cent on other ladles similarly treated. Approximately 0.06 per cent magnesium retained in the iron was necessary to obtain nodular graphite and good physical properties. Sulphur, which analyzed around 0.035 per cent before the addition of magnesium, analyzed less than 0.001 per cent in the nodular castings.

The microstructure of Bar B was quite different from Bar A, as shown in the photomicrographs of Figs. 6, 7, and 8. The graphite in Bar B is almost entirely

nodular and spheroidal, only a few quasi-flakes being present (Fig. 6).

In view of the fact that Bar B tested 109,180 psi tensile strength as-cast, its microstructure was deemed of especial interest. It was found to consist almost entirely of spheroidal graphite and pearlite. It will be remembered that Bar A, testing about 100,000 psi, contained both nodular and semiflake graphite, spheroidized carbides, and ferrite.

The Bar B structure shown in Fig. 7 consists almost entirely of pearlite and spheroidal graphite. About 20 per cent of the graphite had the starlike internal structure shown. Generally, when this structure was found, a central nucleus would not be visible.

Figure 8 shows another spot in the structure of Bar B. Again the structure is practically all pearlite, with nodular graphite. In this case the nodule did not have a starlike structure, but did have a large nucleus, which looks like slag.

The magnesium-treated iron had decidedly more tendency to shrink than did the untreated iron, and a tentative conclusion was reached that it would be necessary to use gates and risers similar to those used in malleable casting practice. Three keel blocks were poured under comparable conditions, except that increasing amounts of magnesium were added. It was noted that as magnesium increased, the keel block "cup down" also increased.

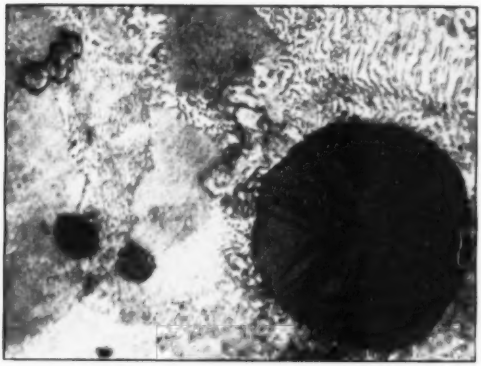
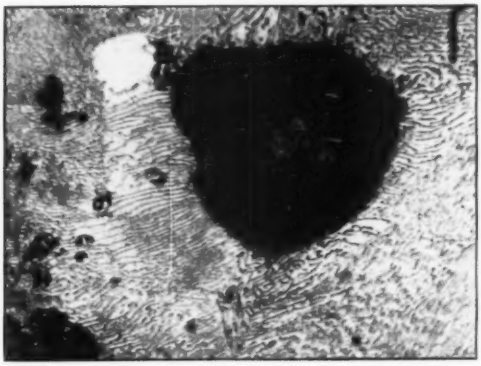


Fig. 7—Bar B. Nital etch. X1000.

Fig. 8—Bar B. Nital etch. X1000.



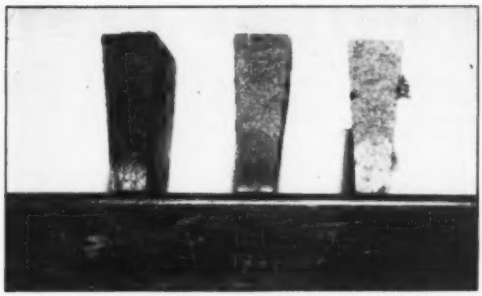


Fig. 9—Effect of magnesium additions on depth of chill.

Cupola Iron

Experiments were made with magnesium additions to a good grade of cupola melted iron of about 42,000 psi tensile strength before alloying. The base metal was of the following average analysis:

	per cent		per cent
Carbon	3.00	Phosphorus	0.28
Manganese	0.75	Silicon	2.20
Sulphur	0.140		

Stick magnesium, and magnesium-copper alloy were added to this metal in amounts up to 1½ per cent magnesium. No significant increase in strength was obtained, and the microstructure showed no nodules. At the time it seemed possible that the rather high phosphorus interfered with the action of the magnesium, so several charges were melted using all steel scrap with added silicon and manganese. The untreated test bars showed approximately 60,000 psi tensile strength, with 0.045 per cent phosphorus, but the metal treated with magnesium showed no greater strength, and no nodules. It is now known that phosphorus is not a deterrent to nodule formation. Reason for the failure of these experiments has not been determined.

It had been expected that additions of magnesium up to 0.75 per cent would cause increase in depth of chill, but actually chill was reduced. Finally, by adding 1.50 per cent magnesium, chill was increased (Fig. 9).

Analyses showed that the magnesium was acting only as a desulphurizer. For example, the addition of 1 per cent magnesium reduced sulphur from 0.14 to 0.05 per cent, but the residual magnesium was not sufficient to cause nodules. The nearest approach to nodular structure was in the intermediate zone of the high chill (Fig. 9).

As facilities were not available for desulphurizing the cupola iron, experiments were continued with low-sulphur electric furnace iron, which responded readily to magnesium treatments. It is probable that the cupola iron would have given iron of the same properties as the electric furnace if it had been possible to desulphurize the cupola metal to a figure comparable to that of the electric furnace.

NOTE: This paper was presented at the Sixth Western Metal Congress, American Society for Metals, at Los Angeles, Apr. 11-15, 1949.

CONTROL CASTING DISTORTION

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ONE OF THE FIRST CONSIDERATIONS in the construction of a pattern is the allowance which must be made to compensate for changes in the properties of the metal after pouring and while it cools to normal temperatures. In many cases the stresses and strains set up as the metal cools and solidifies causes the casting to warp or twist to a degree sufficient to materially alter the shape of the casting.

Several factors contribute to the tendency of castings to change size or forms in the mold. Some of these can be controlled by proper foundry technique. Others may be anticipated and corrected by making some compensatory allowance on the pattern.

In order to anticipate and correct distortion by modification of the pattern it is necessary for the patternmaker to have a clear understanding of the behavior of metal after its introduction to the mold. When heat is applied to metal its physical properties are changed. It first expands in size and, as it reaches the molten state, a further increase in volume takes place. As normal temperatures are reached by contact with air and the mold the phenomena reverse, first a decrease in volume and then further contraction as the metal cools.

The first of these phases is principally the foundryman's concern, and he compensates for it by risers, heads and feeding fresh metal to the mold. The second contraction is covered by the patternmaker who, by use of an appropriate shrink rule, makes his pattern oversize to compensate for the contraction.

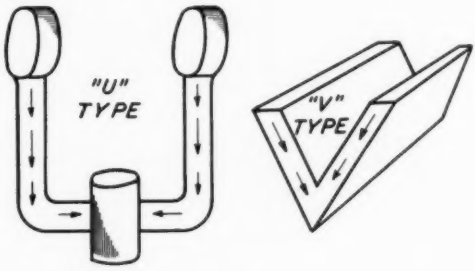
Shrinkage Tables Compiled

Metals vary considerably in amount of shrinkage during the cooling period. Patterns are therefore made to different shrink-rule measurements according to the type of metal used, and standard shrinkage tables have been compiled to assist the patternmaker.* These tables give the average shrinkage of metals and may be relied upon in most cases to produce good results, but it must not be assumed that shrinkage will always be uniform. There are many factors which must be evaluated to achieve good results under adverse conditions. Among these are tight ramming, hard cores, ribs, gates, bosses, and varying metal thicknesses which cause uneven shrinkage and consequent distortion.

Shrinkage and distortion of castings are so closely allied that one can scarcely separate them in any analysis of distortion, for shrinkage is the parent of distortion. While shrinkage may occur without distortion, there can be no distortion without shrinkage for distortion arises from unequal shrinkage. This fact must be recognized if proper allowances are to be made to correct conditions due to unequal shrinkage.

Many foundrymen are disposed to consider casting distortion as unpredictable except by trial and error. Fortunately, most castings, especially the smaller ones, are produced with acceptable accuracy by the application of standard shrinkages in the construction of the pattern. At other times a thorough knowledge of the principles involved is necessary to anticipate and correct distortion.

These principles are best exemplified by classifying castings into the several basic shapes. The first and simplest of these is the "I" shape—simple flat or bar shaped castings with moderate or balanced ribs and flanges, bosses, etc., more or less equalled on each side of the structure. This type causes little trouble from distortion. It is free to shrink without hindrance and the fundamental causes of distortion are absent.



Castings of this type made to standard shrinkage will probably be quite satisfactory.

The next basic design for study is the "U" type which is exemplied by the yoke shown in the sketch. This presents quite different problems from the preceeding example. In this case the sand mold offers resistance to contraction, since the body of sand between the arms will restrict the tendency of the castings to shorten as the metal shrinks.

"Spread Casting" Defined

Since molding sand is compressible in some degree, the body of the casting, which forms the base of the U, will draw the arms closer together at the bottom. However, owing to mold resistance this influence does not extend to the open end, and the result will be a so-called spread casting.

The term "spread casting" should not be taken literally. It has come down from the time when casting techniques were less enlightened than at present and in this case it is misleading. The distance between the arms of the casting did not increase as the term "spread" would imply; rather, it remained constant while the base of the casting contracted. The end result is a distorted casting.

Either of two methods may be used to correct distortion in the "U" type casting. First, a tie bar may be cast between the two arms, of sufficient weight and strength to exert the same constrictive influence on

*CAST METAL HANDBOOK, 3rd ed., pp. 9-10. American Foundrymen's Society, Chicago.

NOTE: This paper was presented, with other prize-winning entries in the Annual Technical Paper Contest of the A.F.S. Eastern Canada Chapter, at the Apr. 8, 1949 Chapter meeting.

the open end of the casting as the metal base exerts upon the lower end. Second, the pattern may be made so that the arms converge sufficiently to compensate for mold resistance. This means that the dimension between the open arms would be made to standard rule on the pattern, while the base would be made to the appropriate shrink-rule measurements.

The "V" type casting (see sketch) bears a superficial resemblance to the "U" type; but closer analysis discloses considerable differences. It would appear that the extremities of the "V" casting would encounter mold resistance and so be subject to distortion, but this is not the case. It is axiomatic that shrinkage follows the structure of the metal, and this should be constantly borne in mind by the patternmaker.

In the "V" casting the lines of shrinkage meet at the junction of the members, but are not subject to distortion because neither is affected by the shrinkage of the other. Both sides are foreshortened in the process of shrinkage, but both remain in the same relative position, and a pattern made to standard shrink measurements will be quite satisfactory because there is no mold resistance to cause distortion.

The "H" type of casting is similar in nature to the "U" type, having unconnected open ends which are subject to mold resistance and, like the "U" type, has a strong disposition toward distortion on the open ends. This type is amenable to the same remedies as were used in the "U" type to correct this tendency.

"Y" type and "L" type castings are variations of the "V" type, and likewise free from mold resistance because the members are free to contract in the straight line through the natural metal structure to the common junction. They are free from restraining influences and may be made without consideration for distortion allowances.

Shrinkage Differs in Circular Types

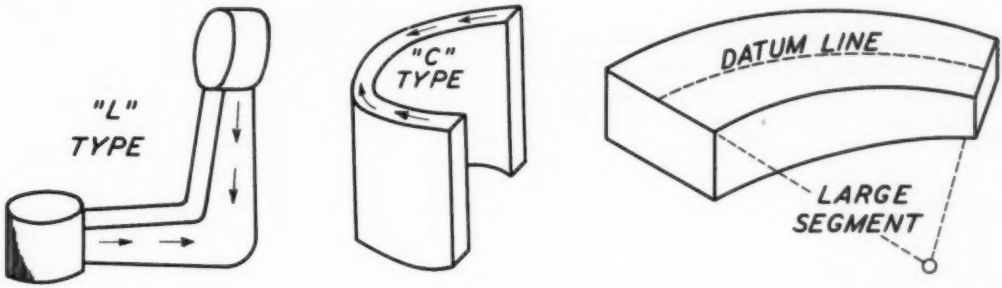
Two other basic designs which appear similar might be termed the "O" and the "C" type. Both are of a circular nature, but they differ widely in shrinkage characteristics, and this has caused much difference of opinion among patternmakers and foundrymen.

It is perhaps natural to assume that since a circular casting shrinks in diameter, a segment of that circle would be governed by the same forces with identical results. This theory seems reasonable but is based on a false premise, as has been shown many times in practice. As previously stated, shrinkage follows the lines of the metal structure. It follows that in this instance shrinkage must be calculated along the lines of an arc and not across the diameter because there is no metal structure across the diameter.

The radius of the pattern should be made to standard rule measurements and allowance made on the ends for the shrinkage which occurs throughout the length of the arc. If the pattern had been made to shrinkage measurements throughout the result would appear as a "spread casting." Actually, it is not a case of distortion but the result of a misapplication of the shrink rule.

Compensate for Segment Shrinkage

Shrinkage following the circular lines of an arc has not changed the diameter of the casting. However, in the case of a segmental casting which has considerable width it should be remembered that the normal shrinkage obtains in the radial width and should be compensated for. This is best done by establishing a datum line along the radial center of the pattern from which measurements are taken with the appropriate shrink rule. This establishes another rule —metal contraction is effective between any points within the structural area of a casting, but is not effective as between a point on the casting and one removed from the casting by any distance. The circular or "O" type casting would seem to refute the foregoing as it appears to be the exception of the rule.



The "O" type casting is often cited to support the theory that all circular types shrink in diameter. It is true that a complete circle does shrink in diameter. Practical geometry teaches that if we shorten the circumference the diameter is inevitably decreased, but it has been proved experimentally that a thin core placed so as to break the continuity of the circle results in an unchanged diameter and a circumference foreshortened by the amount of normal contraction.

Integral members of a casting may be joined in many ways, but usually they can be said to fall within one of the basic designs, and it is good practice to analyse the job in hand from that standpoint. While the foregoing conclusions are based on theory and may vary under different circumstances, their usefulness has been proved in practice. When the basic design has been determined the problem of negotiating counterinfluences will be greatly simplified, and the proper diagnosis in extreme cases will be considerably easier.

National Foundry Association Holds 51ST Annual Meeting in New York

FOUNDRY EXECUTIVES FROM 36 STATES met November 10 and 11 at New York's Waldorf-Astoria Hotel for the 51st Annual Meeting of the National Foundry Association. Highlights of the meeting were election of officers, and addresses by Stevens H. Hammond, Whiting Corp., Harvey, Ill.; Hon. Harold H. Velde (Rep., Ill.); H. W. Heinrich of the Travelers Insurance Co., Hartford, Conn.; Dr. Leo Wolman, National Bureau of Economic Research; Lowell B. Mason, chairman, Federal Trade Commission; and L. E. Roark, executive vice-president, NFA.

Officers elected at the closing session of the meeting were: president, Harry H. Ladwig, Allis-Chalmers Mfg. Co., Milwaukee; vice-president, A. W. Martens, Pekin Foundry & Mfg. Co., Pekin, Ill.; executive vice-president, L. E. Roark; executive director, John P. Ahern; secretary, E. E. Fries; and treasurer, E. B. Sherwin, Chicago Hardware Foundry Co.

Foundry Equipment Manufacturers Hold Annual Meet In West Virginia

ELECTION OF OFFICERS and directors, reports and discussions on the present state and future of the foundry and foundry equipment industries, group meetings, social events and a ladies' get-acquainted tea were features of the 31st Annual Meeting of the Foundry Equipment Manufacturers' Association, held October 13-15 at The Greenbrier, White Sulphur Springs, W. Va.

Officers and directors elected for the ensuing year were: *president*, John Hellstrom, American Air Filter Co., Inc., Louisville, Ky.; *vice-president*, C. V. Nass, Beardsley & Piper Div., Pettibone Mulliken Corp., Chicago; and *executive secretary and treasurer* (re-elected), Arthur J. Tuscany. Directors elected were: Aubrey J. Grindle, Whiting Corp., Harvey, Ill.; Thomas Kaveny, Jr., Herman Pneumatic Machine Co., Pittsburgh; and Victor F. Stine, Pangborn Corp., Hagerstown, Md.

Increasing Number Of Foundrymen Benefit From A.F.S. Fluid Flow Film

FOUNDRYMEN of the Pacific Northwest saw first results of one of the A.F.S.-sponsored research projects the latter part of October when the film *"Fluid Flow in Transparent Molds"* was presented before the British Columbia, the Washington, and the Oregon Chapters. A silent film, often in slow motion to show important details of flow, the movie was accompanied by commentary from A.F.S. Technical Director S. C. Massari who also answered questions after the showing. First public showing was at the 1949 A.F.S. Annual Convention.

One of the most unusual phenomena illustrated by the movie is the negative pressure developed in certain sprue designs which results in air being drawn through the mold wall and carried into the casting where it may later appear as a defect. Principles of construction of runner boxes, sprues, and ingates are brought out. The film shows the results of the first year's work being carried on at Battelle Memorial Institute, Columbus, Ohio, with the goal of deriving optimum design conditions for introducing metal into mold cavities. The principles shown thus far—and expected to be evolved in the course of additional work—will generally be equally applicable to ferrous and to nonferrous castings.

Bookings of the film are being scheduled well in advance to assure availability for showings at chapter meetings, regional foundry conferences, educational institutions, and plant training sessions. A nominal fee to cover replacement cost is charged for each use of the film. Bookings can be made by writing to American Foundrymen's Society, 222 W. Adams St., Chicago 6, Ill.

Panamanian Founders' Son Enrolls In Hackley School Foundry Course

A 15-YEAR OLD STUDENT from Balboa, Canal Zone, hearing of the extensive courses offered by the Hackley Manual Training High School, Muskegon, Mich., recently reactivated through the efforts of the A.F.S. Western Michigan Chapter, has enrolled this fall.

He is Edward Gonzalez, son of a former consul general for Panama who operates a small foundry in that country making soil pipe and kitchen utensils. Edward, who entered Hackley this fall, will complete his high school education there and next year will continue with his foundries studies at Hackley while taking pre-engineering courses at Muskegon Junior College.

Future Meetings and Exhibits

SOCIETY OF AUTOMOTIVE ENGINEERS, annual meeting, Detroit—Jan. 9-13.

MALLEABLE FOUNDERS' SOCIETY, semiannual meeting, Hotel Cleveland, Cleveland—Jan. 20.

INSTITUTE OF SCRAP IRON AND STEEL, INC., annual convention, Hotel Statler, Washington—Jan. 22-24.

BIRMINGHAM REGIONAL FOUNDRY CONFERENCE, A.F.S. Birmingham District Chapter, Tutwiler Hotel, Birmingham, Ala.—Feb. 2-4.

WISCONSIN REGIONAL FOUNDRY CONFERENCE, A.F.S. Wisconsin Chapter, Schroeder Hotel, Milwaukee—Feb. 9-10.

AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS, annual meeting, Pennsylvania Hotel, New York—Feb. 12-16.

AMERICAN SOCIETY FOR TESTING MATERIALS, annual committee week, William Penn Hotel, Pittsburgh—Feb. 27-Mar. 3.

OHIO REGIONAL FOUNDRY CONFERENCE, A.F.S. Cincinnati District, Canton District, Northeastern Ohio, Central Ohio and Toledo Chapters, Netherlands Plaza Hotel, Cincinnati—Mar. 10-11.

STEEL FOUNDERS' SOCIETY OF AMERICA, annual meeting, Edgewater Beach Hotel, Chicago—Mar. 21-22.

AMERICAN SOCIETY OF TOOL ENGINEERS, Philadelphia—Apr. 10-14.

54th Annual Foundry Congress and Exhibit, American Foundrymen's Society, Public Auditorium, Cleveland. May 8-12.

ELECTRIC METAL MAKERS GUILD, annual meeting, Shawnee Hotel, Springfield, Ohio—June 1-3.

AMERICAN SOCIETY FOR TESTING MATERIALS, annual meeting and exhibition, Haddon Hall, Atlantic City, N. J.—June 26-30.

MELTS STEEL IN OXYGEN—CITY GAS FIRED CRUCIBLE FURNACE

James M. Barrabee
Progressive Student
Foundry Engr. & Mgt.
International Harvester Co.
Richmond, Ind.

A STUDY OF FOUNDRY literature shows that the application and use of oxygenated air has been discussed many times, and is finally gaining recognition after much experimental work. The first attempts to enrich air were made by the Belgians at Liège in a small iron blast furnace. In the early 20's the AIME conducted a symposium on the use of oxygenated air[6].

In the discussion at this meeting, two facts were brought out: (1) many metallurgists believed that their operations could be conducted more economically if they could add oxygen to the air used in various melting operations; (2) a number of chemists believed that relatively pure oxygen might be produced in metallurgical quantities at small cost.

Recent publications indicate that these beliefs are now becoming reality. Three plants for making tonnage oxygen (90-95 per cent pure) are in the construction stage and soon will provide the answer to the questions of how cheaply tonnage oxygen can be produced and whether this oxygen will increase production and cut fuel costs.

Design Crucible Furnace

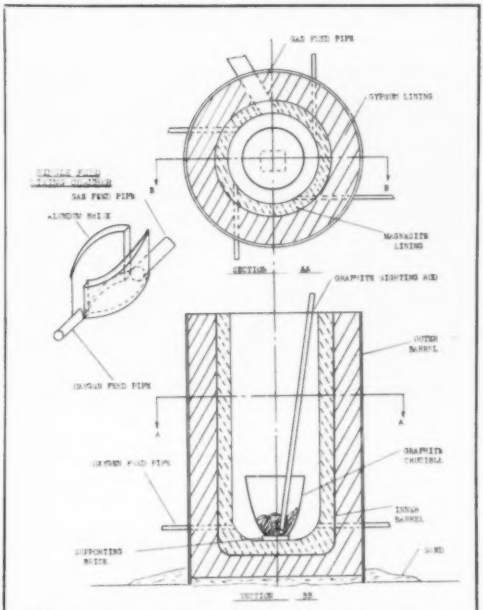
The purpose of the investigation described in this paper was the design and development of an efficient crucible furnace in which it would be possible, by using a mixture of city gas and oxygen, to produce sufficient heat to melt steel. This molten steel would then be used for casting. The small furnace was designed for use mainly in research work and special melting, so that small heats of metal could be melted and treated in one furnace.

Two methods for feeding fuel were developed during the investigation. The first setup provided for separate gas and oxygen inlets, mixing the oxygen and city gas in an oval mixing chamber at the bottom of the furnace[3]. The second method employed additional oxygen inlets and a different chamber to insure better mixing and more complete combustion.

The basic furnace employed was a sheet metal barrel 20 in. in diameter and 35 in. high, lined with alundum refractory to a depth of about 1½ in. This cylinder had been placed inside an ordinary galvanized ash barrel, and the space between the two units filled with gypsum. The gypsum provided additional insulation which further reduced heat losses through the walls.

Previous experiments with alundum had shown that it did not stand up well under the high temperatures required for the melting of steel—the intense oxygen flame had a tendency to erode and fuse the alundum particles. Therefore, the alundum refractory was covered with a mixture of magnesite ($MgCO_3$) and water, to which sodium silicate had been added as a bonding agent.

At the bottom of the furnace an oval mixing chamber was formed from curved alundum bricks, which had also been covered with the magnesite refractory lining. Two ports were cut tangentially on opposite sides of the furnace for introducing the oxygen and city gas into the mixing chamber. The incoming gases followed the curvature of the mixing chamber walls, impinging upon one another perpendicularly and creating the necessary turbulence for mixing.



Diagrammatic sketch showing furnace construction details and the multiple oxygen feed system.

At first, single oxygen and city gas lead-in pipes were used. Various nozzles and extensions were added during the early runs, but no satisfactory method of mixing the two gases was found. The desired high temperatures for steel melting were never reached with this method, and economical operation was not possible since too much oxygen was required for each run.

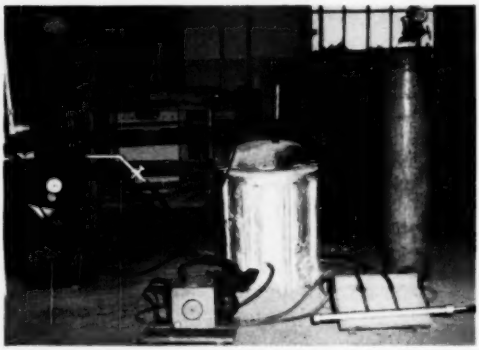
A multiple oxygen feed system was constructed to promote more complete mixing of the incoming gases.

NOTE: This paper was condensed from a thesis written in partial fulfillment of the requirements for a Bachelor of Science degree at Massachusetts Institute of Technology, Cambridge, Mass. The investigation was conducted under the general direction of Howard F. Taylor, associate professor of metallurgy.

The oval mixing chamber was chipped from the furnace; and the walls were rebuilt to rise straight from the bottom of the furnace. The single gas feed port was left in its original position, but the single oxygen feed port was closed with refractory material.

Four equally spaced ¼-in. holes were drilled through the barrel, entering tangentially to the inside of the furnace 1-in. above the furnace floor. Into these holes were inserted four 10-in. lengths of ¼-in. steel pipe which were sealed in position. Four rubber hose lines connected these feed pipes to a manifold type feeder made of 1-in. steel pipe, along the length of which four ¼-in. holes were drilled. Into these holes were brazed four 8-in. lengths of steel pipe which served as connectors for hoses leading to feed pipes.

A straight length of 1½-in. pipe was used for the gas lead-in. This size, it was found, provided the best flow for proper mixing with the incoming oxygen. Good mixing was now accomplished since the force of the



A general view of the furnace showing fuel line arrangement, the graphite tube for temperature determinations, and manifold for the multiple feed system.

oxygen under pressure from a standard 244 cu ft tank carried the gas in a swirling motion completely around the crucible—mixing and igniting on all sides.

Two types of covers were used during the experiments—one made of alundum brick and the other of molded magnesite. In both cases the covers were satisfactory. Two holes were cut in the tops of these covers to allow for the graphite sighting rod and an exhaust outlet for the gases.

The flow of oxygen was determined by a standard pressure gage. It was used as a flowmeter by converting from cylinder pressure to cylinder volume, using either the scale on the gage or conversion tables supplied by the oxygen manufacturer. A standard commercial gas meter was connected between the city gas line and the gas lead-in pipe to determine the total quantity of gas used and the gas flow rate. All runs were timed in order to obtain flow rates and temperature gradients.

Temperature measurements were taken with an optical pyrometer by sighting on a graphite plug at the end of a 3-ft length of graphite tubing. The plugged end of the tubing rested on the charge in the crucible inside the furnace, while the open or sighting end projected through the hole in the furnace cover. Since the tube remained in the furnace for the duration of each run, it was found necessary before each reading to blast compressed air down the tube. This dispersed any accumulation of exhaust gases at the bottom near the plug, and removed any effect the gases might have on the optical temperature reading.

Six runs were made in this investigation—two runs with the single oxygen feed system and four with the multiple system. Some of the experiments were made with both oxygen and with air for purposes of comparison. The charge for each run was made up of 3-in. lengths of "armco" iron bar (½-in. dia.) placed in a no. 8 graphite crucible.

Investigate Fuel Mixing Problems

The first two runs were made with the single feed system and gave an idea of the mixing problems involved. Alundum bricks which had been placed around the crucible as it sat in the furnace were removed because they hindered combustion by confining the mixing and burning to the bottom of the furnace. Various types of nozzles and extensions were tried on both the oxygen and gas inlets, but none seemed to give the high temperatures necessary for melting.

As improper mixing was considered the chief drawback to proper combustion, the multiple oxygen system (previously described) was installed. It was hoped that this system would allow the oxygen to mix completely with the gas and provide nearly complete combustion. As a large amount of oxygen might be needed after temperature readings were available, it was deemed advisable to try an air preheat to around 1500 F. A trial run was made solely to determine the effects of an air-gas preheat, and a temperature of 1500 F was reached in about 20 min.

The fourth run gave some indication of the possibilities of the furnace when using the multiple feed system. A temperature of 2831 F was reached, but the time of 87 min was not indicative of true operating characteristics. An air-gas preheat of 25 min accounted for some loss in time, and even the short period required for necessary oxygen tank change-overs produced a marked drop in temperature which had to be recovered. The average gas flow rate was 2 cfm, and the average oxygen flow rate 6 cfm.

A complete check of the furnace walls showed no erosion and only minor cracking due to linear expansion at high temperature. (Magnesite reaches a maximum linear expansion of ¼-in. per ft at approximately 2800 F[2].) The carbon sighting rod showed erosion after each run and was coated each time with a mixture of alundum powder and sodium silicate.

Preheating With Oxygen

Run no. 6 proved to be the most successful. It was decided to eliminate the air preheat and use oxygen from the beginning of the run. To prevent possible cooling by any excess oxygen and the reaching of an equilibrium temperature point, 1½ times the previous amount of gas was used. A run of 51 min total time gave a temperature of 3011 F and a molten charge from which a specimen was poured as a sample of the successful melt. The average gas flow rate was 3.10 cfm, and the average oxygen flow rate was 5.5 cfm.

The time of the run is not truly indicative of the possible rapid melting rate. A constant oxygen supply would have eliminated 14 min of the heating time which were needed for the oxygen tank change-over and the recovery of the accompanying temperature drop of about 300 F. Only slight fusion was found sporadically in the crucible supporting bricks, but none was found elsewhere in the furnace.

Theoretical calculations were made for flame temperature and heat transfer. Although the figures were approximate, they did show the definite advantages of using oxygen rather than air. In calculating flame temperature, a heating value of 565 BTU/ft^3 or 5011 cal/liter was used with three heat capacity equations[4]. The results of these calculations gave a difference in flame temperature of over 2000 C when using oxygen in place of air[1].

Due to the complexity of heat transfer calculations, only one form of heat transfer was considered in comparing the oxygen advantages with those of air, i.e., radiation from the refractory bed to the crucible[5].

Summary and Conclusions

The principal object of the investigation was the design and construction of the melting unit. Due to lack of time, no attempt was made to pour castings. Molten metal from two heats was poured into pigs, and the metal re-used in subsequent runs. From the results obtained it is believed that the furnace could be used to melt metal for castings and test specimens; and that heats up to about 10 lb could be melted in a short time.

Due to the oxidizing atmosphere of the furnace, the use of some type of flux is indicated. This must be determined by experiment, and with consideration for the type of metal desired.

A constant oxygen supply would be most helpful in preventing large temperature drops during tank change-overs. A "Y" fitting would serve to connect two tanks to the oxygen inlet; as one tank emptied the other could be turned on to keep a constant flow.

The use of compressed air in place of oxygen is a definite possibility in melting lower-melting-point metals. No change in design would be necessary.

An immersion pyrometer would probably be more accurate and convenient than the optical pyrometer and graphite tube used.

The possibility of surrounding the crucible with refractory packing might well be investigated. This method was tried for a short time during one run, but the flame was confined to the bottom of the furnace and the heating effect of the swirling and burning gases was lost.

Construction of a manifold and multiple inlets for the city gas (similar to the oxygen feed system) might contribute toward more complete combustion.

Analysis of flue gas would aid in making more accurate combustion calculations, and the pouring and analysis of castings would help determine the actual performance value of the furnace.

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3. Lawrence and Spear, "Use of City Gas and Oxygen in Melting Practice", B.S. Thesis, M.I.T., 1947.

4. M. Matuszck, *Gas Analysis Manual*, 3rd revised edition, Fisher Scientific Co., Pittsburgh.

5. W. H. McAdams, *Heat Transmission*, 2nd edition, 1942, p. 59; Fig. 25, p. 395.

6. Symposium, "Use of Oxygenated Air in Metallurgical Operations" *Abstracts*, AIME, 1924.

St. Louis Patternmakers Train Cuban Apprentice

Selected by the Departments of State and Labor for their outstanding apprentice program, St. Louis patternmakers are furthering the training of Luis Mojicar of Cuba, first industrial trainee to arrive here under the Government's International Industrial Training Program. On hand to greet Mr. Mojicar were, left to right: Ernest Kramer, Fulton Iron Works; A. W. Nolte, American Steel Foundry Co.; G. W. Apel, Department of Labor; F. W. Burgdorfer, Missouri Pattern Works; Luis Mojicar; R. S. Cardwell, Patternmakers Association; C. E. Rutledge, Department of Labor; E. E. Belton, Progressive Pattern Co.; Elmer Parker, Fulton Iron Works.

Questions and Answers — THE ROUND TABLE

Core Room Dermatitis No Problem

We have heard that dermatitis may develop in some workers making or handling cores containing synthetic resin binders. We plan to use such binders in our core room and would appreciate information and recommendations.

We are not sure that the few cases of dermatitis encountered since synthetic resin binders have been placed in production have been caused by these binders, but circumstances point to the resin, more particularly in the minds of core room personnel, rather than any specific data which we find. We started using synthetic resins at the beginning of a four-month period during which we went from about six tons of resin bonded core sand to 35 tons per day and our personnel working with this material increased from 15 to 53. In the four-month period no dermatitis was reported until the fourth month when six cases developed.

At that time we contacted the manufacturer of the resin, local doctors, and the U. S. Public Health Service. We described the dermatitis as a skin irritation producing a dead white color accompanied by itching, but with no open or watery sores. We were advised to try careful washing several times daily, to use protective coatings, and to wash work clothing frequently. On changing the six men from synthetic resin sand to oil sand, itching ceased immediately and in several days they were able to go back to the resin sand.

In the next four months we had no dermatitis cases, resin sand core production increased to 80 tons per day, and the personnel handling it increased to about 125. Again in the fourth month the six old cases and three new ones developed and were treated successfully as described above. For eight months there was no dermatitis until five cases (three of the original group) developed and these were again successfully treated.

Research by competent dermatologists seems to indicate that the presence of free formaldehyde in the resin might be the cause. However, a change from about 3 per cent to less than 0.5 per cent had no material effect on the incidence of dermatitis. Consistent recurrence of the condition in the early spring and fall may indicate some influence of weather.

Treatment developed by our first aid department consists of washing hands and arms of patients carefully and thoroughly three times daily with a standard mild soap followed by a thin protective coating of salve which we purchase. The worker is taken from resin sand production for two or three days. With the exception of one man, who has developed an itching or skin irritation each time he has worked in the synthetic resin sand, we have been able to cure every case of dermatitis with this treatment. Our first aid department is not entirely willing to cite synthetic resins as the whole cause of the dermatitis and we are not concerned with it as a problem when it can be cured so easily and the frequency rate is no higher than six cases twice a year.

T. W. Curry, *Metallurgist*
Lynchburg Foundry Co.
Lynchburg, Va.

Dermatitis is not a new condition in industry. It has been prevalent in the machine tool industry for years and is attributed to the coolants used in machining operations. During the war years when a large number of women were employed in our core department we had cases of dermatitis even though we were not using synthetic resin binders. We believe that when using synthetic resins we had more cases of dermatitis.

Any of the formaldehyde type resins will cause dermatitis in a few workers and we believe the condition is aggravated by an excess of free formaldehyde. First symptom of the condition, as we encountered it, was appearance of a rash on the hands, wrists, and arms, especially in creases at the joints and it may spread to the upper part of the body.

Our plant doctor provided a salve for the affected workers and eventually some of them became immune. Several isolated cases which could not be treated successfully were removed to other work. The condition is not a major problem in the use of synthetic resins.

Core Room Foreman

Most of our experience with synthetic resins has been in the manufacture and sale of urea-formaldehyde types and we can report that certain workers have shown some susceptibility to urea-formaldehyde resins while others working beside them in the same sand appear to be completely immune. It has never been brought to our attention that serious effects developed and we do not know of any case in which a worker left the job or was transfered.

Those who are allergic say that an uncomfortable skin condition develops on constant contact with the sand. During the war large quantities of urea-formaldehyde resins were used in magnesium founding and those who complained of skin irritation used a special

type of cream on their hands or got all the protection required from a clean, light grade of mineral oil.

We know of cases where the odor has caused complaint, but in one case the worker claims the fumes bring relief from a sinus condition. Urea-formaldehyde resins are widely used in other industries and we believe their use in foundries presents no hazard.

H. L. GEBHART, *Pres.*
United Oil Mfg. Co.
Erie, Pa.

Arc Furnace Melting Of Cast Iron

We are installing a three phase, 200 kva electric furnace for the purpose of making cast iron. It is at present lined basic, but we intend to line it acid when it burns out. We expect to run three 1000 lb heats per eight hour day. We have a fair supply of steel scrap, cast iron scrap, and borings (mixed), the latter free for hauling them away. We should like to have your recommendations as to different methods of adding carbon and silicon. Is there a method of reducing silica sand to silicon?

Our correspondent apparently has in mind the melting of gray cast iron, using a low cost charge consisting of steel scrap, cast iron scrap, and mixed borings. While he does not specifically say so, we assume that he does not intend to use pig iron in the furnace charge.

Taking up the last question first, we do not believe it is too practical to reduce silica from the lining or slag to furnish metallic silicon. It is possible to do this in the acid furnace, under conditions of high temperature and a reducing atmosphere. However, there is no good reason for heating cast iron to the necessary temperature, and the cost in refractory, power, electrodes, and time would be excessive. Another point against such a practice is the fact that a silicon increase from the lining is invariably accompanied by a carbon decrease, resulting in deep chill, bad shrinkage characteristics, and generally poor casting quality of the metal. Most successful melters of electric furnace cast iron are careful to avoid any condition which promotes reduction of silicon from the slag or lining.

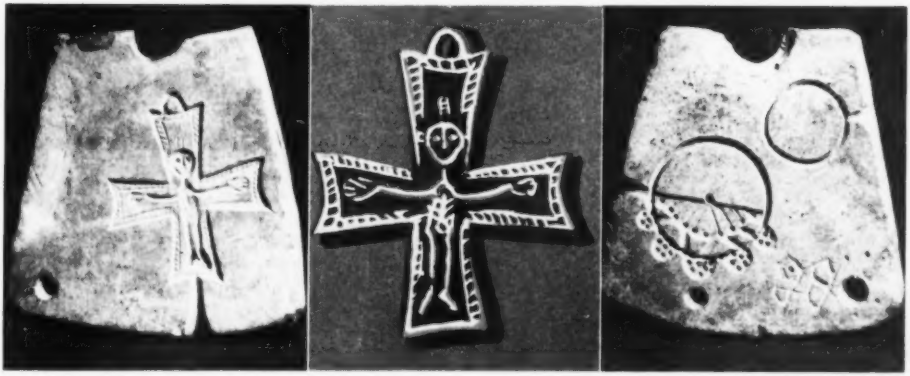
It is very likely that a charge composed of cast scrap, steel scrap, and borings will be deficient in carbon. The greatest operating problem will be to introduce the needed carbon in such a manner as to obtain consistent recovery, thus assuring uniformity of chemical analysis, mechanical properties, and the casting quality of the metal.

Crushed graphite electrode, pitch coke, petroleum coke, coke breeze, and other carburizers have been used for the addition of this element. We believe that the efficiency of such agents is higher as their density is increased and ash content lowered. For that reason, we would suggest the use of crushed graphite electrode or a proprietary graphite product specifically designed for this purpose.

Silicon in the metal tends to prevent absorption of carbon, and a low silicon bath can be carburized to a desired level much more readily than metal of higher silicon content. For this reason, we suggest that the make-up of the original charge include as little silicon as possible and that any silicon necessary to produce the desired analysis be added just prior to tapping the heat, when the metal has absorbed the desired amount of carbon. This late silicon addition can be made in the form of lump 50 per cent ferrosilicon.

We would select charge materials to yield a charge

Casts Cross From Newly-Discovered 1500 Year-Old Permanent Mold



The silver gilt maltese cross (center) was cast recently by Bruno Bearzi, foundryman of Florence, Italy, from a multi-cavity stone permanent mold (right and left photographs) found near Florence this year and believed to date from the fifth century A.D. The cross and photographs of the ancient permanent mold were enclosed by Mr. Bearzi in a letter to Bruce L. Simpson, National Engineering Co., Chicago, the author of DEVELOPMENT OF THE METAL CASTINGS INDUSTRY.

of as low silicon and high carbon content as practical. We would charge a little cast iron on the furnace bottom, followed by the steel scrap or other low carbon material. The needed carburizer in the form of crushed graphite electrode, should be spread over the steel and, in turn, covered by cast iron scrap.

Charge material should be selected for cleanness and to yield a minimum of slag-forming material. After melt-down, the bath should be superheated to the desired temperature (probably about 2750 F) and held at this temperature until the carbon content, as indicated by chill test or a rapid carbon determination, is satisfactory. If necessary, the slag can be raked off and another carburizing addition made to the bare metal in the furnace.

When the carbon is at the desired level, the final silicon addition can be made to the furnace and the heat tapped within two to three minutes. It may take a bit of experimenting to determine the proper amount of carburizer to use. We would start by allowing for a 75 per cent to 85 per cent carbon recovery. Any desired manganese can be added at the same time as the silicon in the form of standard ferromanganese.

In regard to mixed turnings, it would be well to make sure that such materials are free of bearing metals and other contaminants. Mixed materials are apt to seriously affect the consistency of chemical analysis and they should be used sparingly. If contaminated by tin, antimony, and other non-ferrous metals, they can be the cause of serious trouble.

Ralph A. Clark, *Metallurgist*
Electro Metallurgical Co.
Chicago

Simple, Rapid Silicon Determination

We are looking for a rapid method for determining silicon in gray iron for use as a preliminary test.

A commonly used procedure depends on dehydration of silica by fuming with sulphuric acid. Briefly, the procedure is:

1. Dissolve a factor weight, 0.4672 grams, of sample in 50 ml of 1-4 (by volume) sulphuric acid solution in a casserole.

2. Evaporate as rapidly as possible and take to copious fumes of sulphuric acid, avoiding excessive baking.

3. Remove from hot plate, let cool a moment and dilute with hot distilled water to about 100 ml. Warm and filter through rapid, ashless paper.

4. Wash casserole several times into filter and wash paper and precipitate with several alternate washings of hot water and hot 5-95 hydrochloric acid, finishing with several washings of hot water.

5. Ignite at 1000 C in a crucible, let cool briefly, brush silica out on balance pan and weigh rapidly to 0.1 mg. Weight multiplied by 100 is percentage of silicon in original sample.

Variations of the classical sulphuric acid method involve use of special acid mixtures for solution, and use of perchloric acid for solution and dehydration. The latter is particularly convenient if it is desired to determine nickel and chromium, as well as silicon, on the same sample. In the combined method the perchloric acid dehydrates the silica and oxidizes the chromium. Silica is separated in the usual way and ignited, the chromium is titrated with a standard solution of some reducing agent or with an excess of reducing agent followed by titration with a standard potassium permanganate, and the nickel is separated and weighed as nickel dimethylglyoxime.

Fastest way of determining silicon is by means of a direct reading spectrograph such as is described on page 57 of this issue.

Sulphur Printing Not The Answer

We have a small foundry and do not feel we can afford a chemical laboratory. Sulphur has been troubling us and we wonder if we could use sulphur printing to get an indication of the sulphur content of our metal.

Your best possibility is to use the facilities of commercial laboratories which may be near you or to send your work to an outlying laboratory that can give you 24-48 hour service. It seems unlikely that you will be able to get more than a very rough indication of sulphur content from sulphur prints since they are more satisfactory for showing high concentrations and distribution of sulphur. If you wish to experiment, the technique is as follows:

1. In a darkroom, soak dull finish photographic paper in a two per cent sulphuric acid solution and place on a piece of plate glass, emulsion side up.

2. Press the polished face of a specimen upon the paper for 30 to 45 seconds, then wash the print in water.

3. Fix the print in an acid hypo bath such as is normally used in photographic work, and finally wash 30 to 45 minutes in running water if the print is to be preserved.

4. Sulphides will be indicated by brown spots on the paper, the relative concentration of sulphur being indicated approximately by the depth of the color.

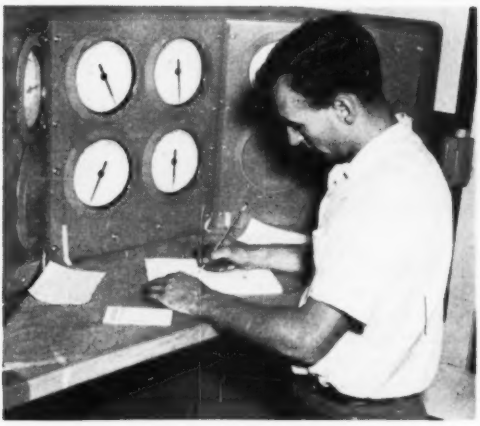
Machining Allowance Varies

What is the general practice on the amount of stock left on castings for surface finish?

Machining or finishing allowance varies with the alloy, the size and shape of the part, the tendency to distort, and the machining method and set-up. Wherever possible, surfaces to be machined should be cast in the drag. Where they must be cast in the cope an extra finishing allowance is generally desirable. A common figure for gray iron where special conditions are not encountered is 1/8 in. For cast steel the machining allowance may be slightly larger and for malleable iron and the nonferrous alloys it will be slightly smaller. As casting size increases the machining allowance increases.

A good detailed guide to machine finish allowances can be found on page 12 of the third edition of the A.F.S. Cast Metals Handbook.

RECORDING DEVICE STREAMLINES ANALYZING OF MOLTEN METAL



SPEED-UP OF 75 PER CENT in the time required to analyze molten metal is reported by the Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., through use of a new, streamlined recording device.

The machine eliminates the photographic processing which takes up to three-fourths of the 20 to 30 minutes required to make a spectographic analysis of metals by standard procedures. Thus, results can now be obtained within five to seven minutes from the time the melting department takes a sample from the ladle.

Metal to be analyzed is taken from cupola or electric furnace and poured into a mold producing pins $\frac{7}{32}$ in. in diameter and which chill instantly. A pneumatic tube carries the pins to the laboratory, where they are ground to shape and placed in electrode holders in the spectrometer. A high-voltage current is passed through the electrodes (samples), vaporizing the samples and causing them to give off light characteristic of their component elements. Lenses and gratings disperse the various wave lengths, which generate electrical currents. Currents varying in intensity are read on dials which show per cent of silicon, manganese, chromium, nickel, copper, and molybdenum present. Dial reading is sent to the melting department by telautograph or by pneumatic tubes. Each sample is tested twice.

(Top, left) Taking metal to be analyzed directly from electric furnace ladle. Metal is then poured into mold producing 7/32 in. diameter pins which chill instantly. (Center, left) The sample material pins are then delivered to the laboratory by a pneumatic tube and are inserted as electrodes in the spectrometer. (Lower, left) After spectrometer is energized, optic and electronic system converts light energy into electrical energy, which actuates dials showing chemical composition percentages of desired elements. (Below) Average readings are then received in melting department by telautograph and materials compositions are corrected.

A.F.S. Bibliography of Centrifugal Casting Lists 800 Articles, Patents

NOW AVAILABLE is the newest A.F.S. publication, BIBLIOGRAPHY OF CENTRIFUGAL CASTING, compiled by Howard F. Taylor and C. L. Register. Originally prepared and compiled during the war to assist the War Metallurgy Committee and the Navy Department, the Bibliography compares centrifugal casting with other casting methods and lists more than 300 articles, arranged by years of publication, and 500 patents.

In addition, the Bibliography contains a brief history of the development of centrifugal casting, a discussion of its fundamentals, and a list of 85 publications in which bibliographic references appear, together with names and locations of publishers and an author index. Copies of BIBLIOGRAPHY OF CENTRIFUGAL CASTING are available at $1.50 each from the American Foundrymen's Society, 222 W. Adams St., Chicago 6.

Non-Ferrous Founders Society Holds Three-Day Annual Meet In Cincinnati

ELECTION OF OFFICERS, plans for the coming year and the first showing of a new film on air pollution were highlights of the Non-Ferrous Founders' Society's Annual Meeting, held in Cincinnati October 13-15. Attending members reported a slight upswing in business in all parts of the country but predicted that current strikes will affect the industry somewhat.

Newly-elected officers of the Society are: *president*, Walter M. Clark, D. W. Clark & Co., Boston; *first vice-president*, J. D. Zaiser, Ampco Metal, Inc., Milwaukee; and *second vice-president*, L. H. Durdin, Dixie Bronze Co., Inc., Birmingham.

A featured event of the program was the premier showing of the Los Angeles Non-Ferrous Foundrymen's Smog Committee's film showing equipment and furnace practices necessary to meet demands of new air pollution laws. Lt. Col. Frank H. Holmes, USAF, Munitions Board liaison officer, spoke on *"Your Advisory Committees and the Munitions Board."*

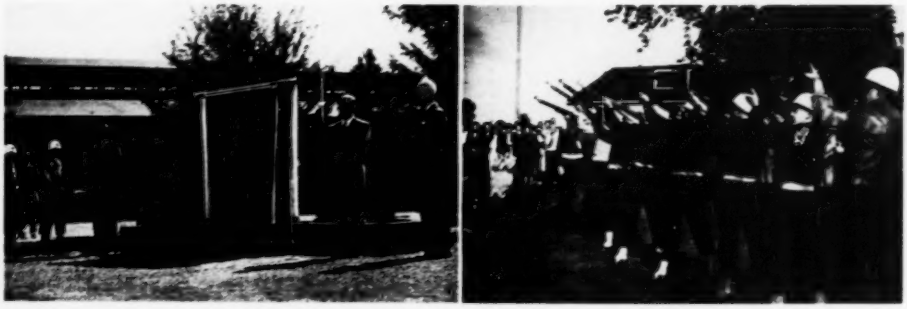
Central Pennsylvania Foundrymen Learn How To Cut Operating Costs

FOUNDRYMEN from the Central Pennsylvania area met October 26 at Pennsylvania State College's School of Mineral Industries to hear Lyle L. Clark, Buick Motor Div., G.M.C., Flint, Mich., speak on *"The Effects of Cupola Operation on Costs."* Presiding was Prof. Robert W. Lindsay of Penn State, chairman of the group—the proposed Central Pennsylvania Chapter of A.F.S.

Basing his talk on operations at Buick, Mr. Clark emphasized that any reduction in costs should be accompanied by maintenance or improvement in casting quality. He described and illustrated ways of doing this and covered a number of special operating techniques. These included uses of rotary kiln cleaners for removing sand from return scrap, proper methods of charging metal and coke, use of tap hole and slag hole blocks, a graphite block for chill tests, and construction of a bosh in the cupola. Mr. Clark also explained the effects of poor charging practice and lack of sufficient voids in the charge.

Foundrymen interested in participating in the activities of the proposed Central Pennsylvania Chapter should contact Prof. R. W. Lindsay, Department of Mineral Technology, Pennsylvania State College, State College, Pa., or W. W. Eichenberger, Milwaukee Foundry Equipment Co., Fairview Ave., Port Royal.

Eaton Foundry Division Honors Its World War II Dead



Relatives of the three World War II dead of the Foundry Division of the Eaton Manufacturing Co., Vassar, Mich., and Division employees gathered September 9 in Vassar to unveil a beautifully designed marble memorial in an impressive ceremony. Members of the local American Legion post fired a salute and the post bugler played "Taps" as Edward C. Hoenicke, Division General Manager, unveiled the Memorial. An invocation by an American Legion chaplain at the company's headquarters in Cleveland, Ohio, was broadcast to the site, followed by a dedication made by Clarence J. Ochs, president of the Eaton Manufacturing Company.

New AFS MEMBERS

NEW SUSTAINING MEMBERS

Brumley-Donaldson Co., Los Angeles, California—L. O. Hofstetter, Vice Pres. & Sales Mgr.—Conversion from Company—(Southern California Chapter).

NEW COMPANY MEMBERS

Oxnard Aluminum & Brass Fdy., Oxnard, California—Ernest R. Wennerholm, Owner & Mgr.—Conversion from Personal—(Southern California Chapter).

Teziutlan Copper Co. S. A., Puebla, Mexico—Ing. Walter Ehrenberg, Mgr., (Mexico City Chapter).

BIRMINGHAM CHAPTER

Robert L. Crane, Partner, Crane Foundry Co., Birmingham, Ala.
William Moughon Schuler, Schuler Equipment Co., Birmingham, Ala.

BRITISH COLUMBIA CHAPTER

Norman Amundsen, Brass Foundry Fmn., Terminal City Iron Works, New Westminster, B. C., Canada.
David Bankier, Appr., A 1 Steel Foundry, Ltd., Vancouver, B. C., Canada.
George Couturier, Appr., A 1 Steel Foundry, Ltd., Vancouver, B. C., Canada.
John E. Cunningham, Appr., Terminal City Iron Works, Ltd., Vancouver, B. C., Canada.
John L. Federal, Appr., Major Aluminum Products, Ltd., Vancouver, B. C., Canada.
D. R. Gore, Appr., Terminal City Iron Works, Ltd., Vancouver, B. C., Canada.
Charles E. Quirt, Appr., McLean & Powell Iron Works, Vancouver, B. C., Canada.
Omer Le Compte, Appr., Major Aluminum Products, Ltd., Vancouver, B. C., Canada.
Donald Edward McLennon, Appr., Terminal City Iron Works, Ltd., Vancouver, B. C., Canada.
Walter C. Motron, Appr., Maple Leaf Pattern Works, Vancouver, B. C., Canada.
David H. Palmer, Appr., Major Aluminum Products, Ltd., Vancouver, B. C., Canada.
Ronald L. Richardson, Appr., A 1 Pattern Shop & Brass Foundry, Vancouver, B. C., Canada.
Lorne Russell, Appr., Wm. McPhail & Sons (Canada) Ltd., Vancouver, B. C., Canada.
Wallace Thompson, Appr., A 1 Pattern Shop & Brass Foundry, Vancouver, B. C., Canada.
Barrie Wright, Appr., A 1 Steel Foundry, Ltd., Vancouver, B. C., Canada.

CENTRAL NEW YORK CHAPTER

J. T. Coggin, Met., General Electric Co., Elmira, N. Y.
Louis Iannettoni, Research Asst., Syracuse University, Syracuse, N. Y.

CHICAGO CHAPTER

E. Bergstrom, Partner, East Chicago Pattern Works, East Chicago, Ind.
John M. Cuculic, Pattern Shop Fmn., Continental Foundry & Machine Co., East Chicago, Ind.
Fred H. Dix, Fdy. Instr., Chicago Board of Education, Chicago.
F. M. Fahrenwald, Fahralloy Co., Harvey, Ill.
A. E. Gatto, Pattern Engr., Continental Foundry & Machine Co., East Chicago, Ind.
Jay P. Lewis, Fmn., Fdy., Continental Foundry & Machine Co., East Chicago, Ind.
Charles E. Roland, Fdy. Instr., Lane Tech. High School, Chicago.
Howard W. Smith, Supv. Fdy. Vocational High Schools, Board of Education, Chicago.
L. L. Sutherland, Instr., Lane Tech. High School, Chicago.

CINCINNATI CHAPTER

Herbert L. Klebanow, Student, University of Cincinnati, Cincinnati.
Elwood B. Norris, Student, University of Cincinnati, Cincinnati.
Donald J. West, Student, University of Cincinnati, Cincinnati.

DETROIT CHAPTER

W. E. McCullough, Chief Met., Bohn Aluminum & Brass Corp., Detroit.
Kenneth C. Wray, Sales Engr., A. T. Wagner Co., Detroit.

EASTERN CANADA CHAPTER

Glen Feidel, Works Mgr., Acadia Gas Engines, Ltd., Nova Scotia, Canada.
Melbourne E. Nixon, Engr., Canadian Car & Foundry Co., Montreal, Que., Canada.
Charles Hubert Perrault, Met., Sorel Steel Foundries, Ltd., Sorel, Que., Canada.
Richard B. Whiting, Slsmn., La Salle Coke Co., Montreal, Que., Canada.

EASTERN NEW YORK CHAPTER

Charles F. Barrett, Jr., Met., General Electric Co., Schenectady, N. Y.

METROPOLITAN CHAPTER

Edward J. Donegan, Special Appr., American Brake Shoe Co., Brake Shoe & Castings Div., Mahwah, N. J.

MEXICO CITY CHAPTER

Alejandro Gonzalez, Jr., Escuela Nacional De Ingenieros, Sinaloa, Mexico.
Patricio G. Quintanilla, Ingenero-Dir. Tecnico, Teziutlan Copper Co., S. A., Puebla, Mexico
Teziutlan Copper Co., S. A., Puebla, Mexico—(Ing. Walter Ehrenberg, Mgr.).

MICHIANA CHAPTER

Ralph H. Brown, Slsmn., Pickands Mather & Co., Chicago.
Albert R. Schreiber, Asst. Plant Engr., Dodge Mfg. Corp., Mishawaka, Ind.

NORTHEASTERN OHIO CHAPTER

Wayne C. Johnson, Sales Repr., Walter C. Best, Inc., Chardon, Ohio.
Joseph M. Kreiner, Asst. Engr. Ry. Div., National Malleable & Steel Cstgs. Co., Cleveland.
Maximilian C. Schoetz, Sales Engr., Aluminum Co. of America, Cleveland
Ernest F. Thomas, Core Room Fmn., Ohio Foundry Co., Cleveland
Ellis A. Wiley, Dir. of Trades Training, Cuyahoga Hts. Board of Education, Cleveland.

NORTHERN CALIFORNIA CHAPTER

Edward K. Jones, Slsmn., Rincon Iron & Brass Foundry, San Francisco

NORTHWESTERN PENNSYLVANIA CHAPTER

George Behringer, Jr., Mgr., Standard Pattern Works, Erie, Pa.

ONTARIO CHAPTER

Frank Kenneth Gardner, Works Mgr., R. McDougall Co., Ltd., Galt, Ont. Canada.
Russell Gordon Gardner, Appr. Moulder, Babcock-Wilcox & Goldie-McCullogh, Ltd., Galt, Ont., Canada.

OREGON CHAPTER

Douglas Farrell, Appr., Central Brass & Iron Fdy., Portland, Ore.

PHILADELPHIA CHAPTER

Paul V. Hannas, Instr. in Met. Engrg., Drexel Institute of Tech. Philadelphia.
George M. Howell, Asst. Tech. Engr., New Jersey Silica Sand Co. Millville, N. J.
Ralph W. E. Leiter, Chief Met., The Budd Co., Philadelphia

QUAD CITY CHAPTER

John T. Littleton, Slsmn., Republic Coal & Coke Co., Chicago.
Julius Leo Van Mechelen, Fmn., John Deere Planter Works, Deere & Co., Moline, Ill.

ROCHESTER CHAPTER

E. S. Stem, Jr., Owner, Stem S. Heider Co., Rochester, N. Y.

SAGINAW VALLEY CHAPTER

Raymond Canfield, Met., Almont Mfg. Co., Imlay City, Mich.
Samuel D. Griffin, Student, General Motors Institute, Flint, Mich.
John F. Hildebrand, Met., The Dow Chemical Co., Midland, Mich.

Roland Kwaiser, Gen. Fmn., Central Fdy. Div., G.M.C., Saginaw Malleable Plant, Saginaw, Mich.
Anthony Simon, Fmn., Chevrolet Grey Iron Fdy., G.M.C., Saginaw, Mich.
Paul Van Amburg, Employment Office, General Fdy. & Mfg. Co., Flint, Mich.
Lester E. Wilensky, Res. & Dev. Engr., The Dow Chemical Co., Midland, Mich.
Lawrence L. Zinsmeister, Cupola Operating Met., Eaton Mfg. Co., Vassar Fdy. Div., Saginaw, Mich.

ST. LOUIS CHAPTER

E. T. Baird, Sales Repr., Midwest Foundry Supply Co., Edwardsville, Ill.
Warren A. Pouver, Abrasive Engr., Bay State Abrasive Co., Chicago.
Carl M. Zvanut, Met., Western Cartridge Co., East Alton, Ill.

SOUTHERN CALIFORNIA CHAPTER

Stanfurd L. Jackson, Elect. Met. Div., Union Carbide & Carbon Corp., Los Angeles.
John R. Small, Met., U. S. Naval Ordnance Test Station, Inyokern, Calif.

TENNESSEE CHAPTER

Charles H. Arnold, Slsmn., Porter Warner Industries, Chattanooga, Tenn.
J. Leonard Raulston, U. S. Stove Corp., South Pittsburg, Tenn.

TEXAS CHAPTER

Charles F. Lewis, Met. Engr., Cook Heat Treating Co., Houston, Texas.

WASHINGTON CHAPTER

Bruce J. Paulsen, Dist. Mgr., Laclede Christy Co., Seattle.

WESTERN MICHIGAN CHAPTER

Frank Boutell, Fmn., Paul M. Wiener Fdy. Co., Muskegon, Mich.
Garfield Brush, Supv., Melting Dept., Lakey Foundry & Machine Co., Muskegon, Mich.
Hale Burnham, Supt., Lakey Foundry & Machine Co., Muskegon, Mich.
Donald F. Figge, Asst. Chief Inspector, Lakey Foundry & Machine Co., Muskegon, Mich.
Clarence H. Fitz, Asst. Fdy Supt., Wolverine Brass Works, Grand Rapids, Mich.
William G. Forsberg, Pattern Shop Supv., Campbell, Wyant & Cannon Fdy. Co., Muskegon, Mich.
Leo Goldman, Fmn., Paul M. Wiener Fdy. Co., Muskegon, Mich.
Harold M. Knowles, Fmn., Paul M. Wiener Fdy. Co., Muskegon, Mich.
Max Kroll, Fmn., Paul M. Wiener Fdy. Co., Muskegon, Mich.
Benjamin F. Park, Sales Repr., Campbell, Wyant & Cannon Fdy. Co., Muskegon, Mich.
Robert Peltier, Fdy. Supv., Campbell Wyant & Cannon Fdy. Co., Muskegon, Mich.
Michael J. Popovich, Fmn., Paul M. Wiener Fdy. Co., Muskegon, Mich.
Joseph W. Sutcliff, Supv., Stock Room, Lakey Foundry & Machine Co., Muskegon, Mich.
Karl O. Trappe, Fmn., Campbell Wyant & Cannon Fdy. Co., Muskegon, Mich.
Gerrit Weideman, Fmn., Paul M. Wiener Fdy. Co., Muskegon, Mich.
Charles R. Young, Quality Analyst, Lakey Foundry & Machine Co., Muskegon, Mich.

WISCONSIN CHAPTER

Thomas Werner Seaton, Fdy. Engr., Allis-Chalmers Mfg. Co., West Allis, Wis.
Tom H. Tanner, Appr., Allis-Chalmers Mfg. Co., West Allis, Wis.

STUDENT CHAPTERS

MISSOURI SCHOOL OF MINES

Robert H. Erskine
Thomas R. Evans
George E. Ferber
Charles O. Kunz
Seymour Megeff
Wm. F. Ricketts, Jr.
Robert C. Settgas
Frank A. Soukup
J. P. Tarwater

TEXAS A & M

Joseph Z. Brewer
Jos. W. Canning, Jr.
Wm. E. Forsythe
Harold Kent Hann
George K. Harding
Robert L. Henninger
Joel E. Lovell
Richard E. Pangburn

UNIVERSITY OF ILLINOIS

Rolla R. Butler
LeRoy E. Cramer
Wm. R. Ellenberger
Harlan E. Mitchell
Richard F. Parrill
Rex Phares
James R. Price
Orville H. Rinne
Fred H. Scheeler
Gene Seaney
Paul L. Smith
Joseph Szekely
Edward E. Thomas
Lawrence H. Vroman
Jon H. Winston

OUTSIDE OF CHAPTER

George E. Herbst, Pittsburgh, Pa.

COMMITTEES MEET

(Continued from page 33)

S. C. Massari announced that a third copy of the A.F.S. film, *"Fluid Flow in Transparent Molds,"* had been made in order to speed up circulation of the film.

Mr. Massari suggested that the third year of research work at Battelle concentrate on aluminum castings made in sand and permanent mold, in order to confirm the research projects already undertaken.

Among reports of the various committees made at the meeting, it was brought out that A.F.S. Headquarters has purchased an offset multigraphing machine which will be used for printing publications, among them the Design and Stress Committee's manual, now in preparation. It was further reported that the Sand Casting Committee has proposed four projects: (1) A paper on melting equipment to be prepared by the Battelle Memorial Institute, (2) A paper on casting characteristics to be prepared by Ray Quadt, American Smelting & Refining Co., (3) A paper on grain refining methods to be prepared by Blake M. Loring, Naval Research Laboratory, and (4) a paper on microporosity to be prepared by Walter Bonsack, Apex Smelting & Refining Co.

The meeting concluded with discussion of the costs involved in preparing the A.F.S. film, *"Fluid Flow in Transparent Molds,"* part of the Aluminum & Magnesium Division's Research Project being carried on at Battelle Memorial Institute, Columbus, Ohio.

The A.F.S. Timestudy and Methods Committee is currently carrying out a program to develop a satisfactory set of fatigue allowances and a workable method of applying such allowances to foundry incentives.

In order to accomplish its program, the committee has sent questionnaires to 936 A.F.S. Company and Sustaining members requesting that each company applying fatigue allowances to its operations explain what values are used, and specific job conditions on which variables, if any, are based. To date a high percentage of the organizations queried have replied in detail and these and subsequent replies will be used as a basis for a survey to be published.

Chicago Chapter Plans "How To Do It" Course In Practical Foundry Work

DEMONSTRATIONS OF FUNDAMENTAL foundry practices will be a feature of the Chicago Chapter's "How You Can Become a Better Foundryman" course to be given at the People's Gas auditorium, Chicago, the second and fourth Monday evenings of each month, January through March, 1950.

These "how to do it" demonstrations will cover specific subjects at each session. The first session will deal with sand and subsequent sessions, in order, will cover molding, coremaking, melting and pouring, cleaning of castings and inspection of castings. Demonstrations will be made by foundrymen thoroughly experienced in each subject. Fee for the entire course of six demonstrations is $1.00. Certificates of attendance will be awarded all who complete the course.

Further details on the course may be obtained by writing J. H. Eckenroad, secretary, Crane Co., 4100 South Kedzie Ave., Chicago 5.

WHO'S WHO

M. J. Henley

Malcolm J. Henley, author of *"Increase Refractory Life in Malleable Melting,"* Page 30, is research metallurgist for Texas Foundries, Inc., Lufkin, Texas . . . A native of Fulton, Ky., Mr. Henley received his bachelor's and master's degrees from Vanderbilt University, Nashville, Tenn. . . . In 1938, he became superintendent of American Cast Iron Pipe Co.'s pipe foundry, Birmingham, Ala., remaining there until 1946, when he was appointed research metallurgist for Texas Foundries, Inc. . . . He is a director and chairman of the Educational Committee of the Texas Chapter of A.F.S.

J. M. Barrabee

James M. Barrabee, author of *"Melts Steel in Oxygen-City Gas Fired Crucible Furnace,"* Page 51, is completing a course in foundry management and engineering with the International Harvester Co., Richmond, Ind. . . . A native of Brookline, Mass., Mr. Barrabee graduated from the Massachusetts Institute of Technology, Cambridge, in 1948, following two years' service with a Navy air-sea rescue unit . . . He joined International Harvester's student course in foundry management and engineering in March, 1948.

E. K. Smith

E. K. Smith, author of *"Experiments in Nodular Iron,"* Page 45, is a consulting metallurgist, with offices in Los Angeles . . . A native of New Jersey, Mr. Smith graduated with special honors in metallurgy from Yale University's Sheffield Scientific School . . . Beginning his career as a metallurgist with Eastern Malleable Iron Co., Naugatuck, Conn., Mr. Smith was successively employed in executive metallurgical capacities with Wisconsin Malleable Iron Co., Milwaukee; Stockham Valves & Fittings, Birmingham; Electro Metallurgical Div., Union Carbide & Carbon Corp., Chicago and Detroit . . . In 1942 he was commissioned a Major in the Army's Ordnance Department, and in 1944 was sent to Chungking, China, by the U. S. Department of State to inspect arsenals . . . Returning to this country in 1945, Mr. Smith established his own business as consulting metallurgist in Los Angeles . . . Mr. Smith has spoken before national conventions of the American Foundrymen's Society and other technical organizations in the metals field, and has written articles on gray iron metallurgy and on Chinese wartime foundries for the trade press . . . He is chairman of the A.F.S. Southern California Chapter's Educational Committee.

L. T. Schackenbach

L. T. Schackenbach, author of *"Modern Foundry Methods,"* in the September, 1949, issue, is precision casting engineer for Sperry Gyroscope Co.'s Mercast process . . . After attending the College of the City of New York and the University of Illinois from 1936 to 1940, Mr. Schackenbach joined the Crucible Steel Co., Harrison, N. J., as a metallurgist . . . He served three years in the Army before joining Sperry . . . Holder of two patents on the manufacture of engine cylinders, Mr. Schackenbach has presented several papers on induction heating before meetings of metals technical societies.

M. Z. Lopez

Macedonio Z. Lopez, author of *"The Foundry Industry in Argentina,"* Page 34, is chief of the Production Division of La Cantabrica, Buenos Aires . . . A graduate in mechanical and electrical engineering of the University of La Plata in 1935, Mr. Lopez had previously risen from locomotive cleaner to assistant engineer (1925-1936) at the LaPlata Works of the Province of Buenos Aires Railway . . . In 1936, Mr. Lopez joined a South American factory of the Eveready Battery Co. at Buenos Aires as factory engineer, and four years later was appointed head of La Cantabrica's foundry . . . Four years later, Mr. Lopez was forced by a serious illness to retire to the mountains for a year and upon his return was appointed to his present position as chief of the company's production division.

Department Of Commerce Issues 1947 Manufactures Census

One of 82 reports comprising the U. S. Department of Commerce *1947 Census of Manufactures,* Booklet MC33A lists statistics on steel and iron foundries, steel mills and blast furnaces in the United States during the year 1947.

Included in the booklet are statistics on the number of establishments in each industry, number of employees, total wages paid, value of products shipped, production of iron and steel castings, and the number of iron and steel foundries with machine and pattern shops.

National Foundry Association Holds Regional Meets

Two regional meetings of the National Foundry Association, one held October 5 in Cincinnati, and the other held the following day in Indianapolis, featured talks by I. Richards Wagner, Electric Steel Castings Co., Indianapolis, and L. E. Roark, executive vice-president of the Association, on changes in legislation, educational programs and general foundry conditions.

More Names For New Iron

If it were not for certain differences in the physical and mechanical properties of the new magnesium and cerium treated cast irons and those of malleable cast irons, there would be little cause for the present agitation "(What's in a Name?" American Foundryman, October and November, 1949). It has been rather conclusively established that certain differences in physical properties do exist for the two types of cast irons under consideration, and it has also been just as conclusively established that the graphite of either type does not possess a physical appearance, or properties, all of which are common to the other.

The heat-treated white cast irons have long been referred to as "malleable irons," and it is believed that not only has this been justified, but that, for the sake of precedent, this custom should be continued. Since some of the new types of cast irons may also be just as rightly termed malleable, it would be necessary to qualify the term to apply to both types.

FOUNDRY *Personalities*

Wayne H. Gunselman, formerly general manager of the Non-Ferrous Div., Buffalo Pipe & Foundry Corp., Buffalo, N. Y., has been named head of the new building and expansion program of Mohawk Foundries, Inc., Buffalo, where he will set up a new brass and bronze permanent mold division and supervise building and organization of a metallurgical laboratory. A member of the A.F.S. Aluminum & Magnesium Division's Committee on Reclamation and Alloying, Mr. Gunselman was director of the metallurgical department of the National Bronze & Aluminum Foundry Co., Cleveland, from 1940 to 1945, and from 1945 to 1948 was director of research for Samuel Greenfield Co., Inc., New York.

W. H. Gunselman

Chris T. Jensen, for the last five years direct factory representative for the Cleveland Flux Co. in several southern Wisconsin cities, has been appointed Cleveland Flux representative for the entire state of Wisconsin.

Harry E. Gravlin, Ford Motor Co., Dearborn, Mich., is spending the school year at Massachusetts Institute of Technology, Cambridge, Mass., on a Sloan Fellowship. His position with Ford is melting division superintendent.

John Van Haver, formerly with the Worthington Pump & Machinery Corp., Harrison, N. J., and a director of the A.F.S. Metropolitan Chapter, is now with the Sealed Power Corp., Muskegon, Mich.

Price B. Burgess, an instructor at the University of Michigan, was recently appointed sales engineer for Foundry Services, Inc., Chicago. Holder of a B. Met. E. from Rensselaer Polytechnic Institute and an M. Bus. Ad. from the University of Michigan, Mr. Burgess was with Revere Copper & Brass, Inc., as methods engineer, and with the Wyman-Gordon Co., Worcester, Mass., as assistant research metallurgist prior to joining the University.

William Grede of Grede Foundries, Inc., Milwaukee, has been named to a three-man committee for the awarding of Allis-Chalmers Mfg. Co. scholarships. Under the Allis-Chalmers Scholarship Plan, the committee will choose five winners each year from among children of company employees.

William Grede

A. R. D. Kirby, formerly assistant manager, Knete Castings, Ltd., Childerditch, England, has been appointed general foreman of the Doncaster, England, works of the International Harvester Co. of Great Britain, Ltd.

Charles F. Pascoe will head the newly-created Research Department of the Canadian Car & Foundry Co., Ltd., Montreal. Mr. Pascoe was formerly assistant general manager of the company's Foundry Division, heading the Longue Point and Brantford foundries. He will be assisted in the Research Department by **E. Jude,** newly-appointed assistant director of research for the company.

George W. Cannon, until recently chairman of the board of the Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., was presented with the Gold Medal Award of the Gray Iron Founders' Society for outstanding contributions to the general welfare of the foundry industry at the Society's Annual Meeting, October 28. Mr. Cannon played a major role in the work of the War Production Board and later the Munitions Board during the war and since the war has been instrumental in re-establishing foundry courses at Muskegon's Hackley Manual Training High School after 20 years' dormancy.

John Rush, formerly foundry superintendent, Elkhart Brass Co., Elkhart, Ind., has been appointed superintendent of the Globe Valve Corp.'s foundry at Delphi, Ind., succeeding Don May, who recently left the company.

N. B. Ornitz, a director and vice-president of the Blaw-Knox Co., Pittsburgh, has been named to the newly-created position of manager of foundry operations of the company's Pittsburgh district. Mr. Ornitz founded the National Alloy Steel Co., Blawnox, Pa., which in 1927 became part of the Blaw-Knox Co.

N. B. Ornitz

William M. Ball, III, formerly with the Cincinnati Milling Machine Co., has joined the technical staff of the Harry W. Dietert Co., Detroit, as consulting engineer, directing research work on molding materials for the company.

J. L. Lessman, assistant foundry superintendent, Cooper Alloy Foundry Co., Hillside, N. J., has been named manager of valve and fitting sales. A graduate in chemical engineering of the University of Missouri, Mr. Lessman was general foundry foreman for American Steel Foundries prior to joining Cooper.

N. L. Watkins, formerly manufacturing engineer for the Westinghouse Electric Corp., Pittsburgh, has joined Almco Div., Queen Stove Works, Inc., Albert Lea, Minn., as chief development engineer.

Harry C. Platt has been appointed vice-president of the Engineered Castings Div., and **William H. Starbuck,** vice-president of the Kellogg Div., American Brake Shoe Co. Mr. Platt has been with Brake Shoe since his graduation from MIT in 1942, and Mr. Starbuck was formerly assistant general sales manager for Brake Shoe.

Stanley H. Davis, Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., vice-chairman of the A.F.S. Western Michigan Chapter, has been appointed chairman of the Chapter's Advisory Committee to the Foundry Classes at the Hackley Manual Training High School, Muskegon.

Marvin W. Smith, president of the Baldwin Locomotive Works, Philadelphia, has been elected a director of the Westinghouse Electric Corp., Pittsburgh. Mr. Smith was an employee of Westinghouse for 33 years before joining Baldwin.

Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., announces the appointment of **Joseph M. Schappert** as industrial relations director and **W. A. Geisler** as metallurgist in the company's research and development department. Mr. Schappert was formerly director of industrial education for the National Metal Association. Mr. Geisler, who arrived here this summer from Germany, where he was general manager of four foundries for Goetzewerke, Cologne, has been employed for 20 years in foundries in Europe and the United States.

T. E. Anderson has been named district sales manager of the Chicago office of the Ohio Ferro Alloys Corp., Canton, Ohio, succeeding the late B. A. Patch, Jr. Mr. Anderson has been in charge of central district sales at the Canton office.

Henry F. Welsch, one of the founders and past vice-president of the Laclede Stoker Co., St. Louis, has been elected president and treasurer of the company.

Harold G. Ingersoll, vice-president in charge of the Ingersoll Steel Div., Borg-Warner Corp., New Castle, Ind., has been elected president of the Indiana Manufacturers' Association. **E. J. Carlson,** president of the Indiana Forge & Machine Co., East Chicago, Ind., was named second vice-president of the Association.

C. M. Lewis has succeeded **A. J. Ricker,** who recently retired, as president of the Badger Malleable & Mfg. Co., South Milwaukee, Wis.

Oliver Smalley, president of the Meehanite Metal Corp., recently received a gold medal placque from the Manufacturers of Meehanite Castings at their 24th annual convention, held at the Hotel Carter, Cleveland, November 2-5. Mr. Smalley has guided the company for 25 years and has been responsible for its expansion in Europe, Africa, South America and Australia. A feature of the meeting was a symposium on the production of nodular Meehanite castings, including discussion of manufacturing methods and procedures, analysis and sales potential.

Edward D. Boyle, master molder and **Edward J. McAfee,** master patternmaker, Puget Sound Naval Shipyard, Bremerton, Wash., were recently recipients of the Navy's Meritorious Civilian Awards. Mr. Boyle, who is chairman of the A.F.S. Washington Chapter, received a citation "for especially noteworthy service" in the development and use of new insulating materials for the foundry industry. Mr. McAfee, a director of the Washington Chapter, was cited for his work in producing new plastic pattern methods for overcoming difficult pattern problems.

E. D. Boyle

E. J. McAfee

G. K. Eggleston has been named vice-president in charge of manufacturing and **S. E. Gregory** general sales manager for the newly formed Non-Ferrous Perma Mold, Inc., Mansfield, Ohio. Mr. Eggleston was formerly vice-president of engineering for the Barnes Mfg. Co. and has for many years been active on A.F.S. technical committees. Mr. Gregory comes to the Ohio organization from Non-Ferrous Die Casting Co., Ltd., London, England, where he has worked with permanent mold casting of non-ferrous alloys for 12 years. Barnes Mfg. Co. and the British organization are joint owners of the new Non-Ferrous Perma Mold, Inc.

G. K. Eggleston

H. R. Salisbury has been appointed president of the Air Reduction Co., Inc., New York. Mr. Salisbury has been with Air Reduction for more than 23 years in various executive capacities.

Jack Victorine has been named general sales manager and **Morton C. Meyers** assistant sales manager of the Cooper Alloy Foundry Co., Hillside, N. J. Mr. Victorine has been with the company for 17 years and sales manager for eight years. Mr. Meyers, who has been with Cooper for 12 years, has served as direct assistant to Mr. Victorine since 1945.

Stafford W. Chapell, Sr., since 1932 superintendent of foundries for the Electric Boat Co., Groton, Conn., was accorded a testimonial dinner by New England foundrymen November 10 on the occasion of his retirement after nearly 60 years in the foundry industry.

Henry J. Kozlowski, research metallurgist for the Physical Metallurgy Div., Canadian Bureau of Mines, Ottawa, Ont., is on leave of absence from that organization while undertaking graduate studies in physical metallurgy at Yale University, New Haven, Conn. Mr. Kozlowski holds a B.Sc. from Queen's University, Kingston, Ont., and an M.Sc. from the University of Birmingham, Birmingham, England.

E. B. Hansen, secretary and general manager of the Wisconsin Appleton Co., South Milwaukee, Wis., captive malleable iron foundry for the Appleton Electric Co., Chicago, has resigned his position and will take an extended vacation before resuming active duty.

S. A. Press, formerly of the New York Paint, Lacquer and Varnish Manufacturers' Association, has been named general sales manager of the Swan-Finch Oil Corp., New York, according to an announcement by Company President Howard L. Moncrieff.

Conrad C. Wissmann, formerly metallurgist with the Los Angeles Steel Casting Co., has been appointed research metallurgist for the Solar Aircraft Co., San Diego, Calif. A graduate of the University of California, Mr. Wissmann was with the Columbia Steel Corp., Torrance, Calif., and the Haberfeld Steel Foundry, Bakersfield, Calif., prior to joining the Los Angeles Steel Casting Co.

David C. Minton, Jr., assistant to the director of Battelle Memorial Institute, Columbus, Ohio, has been named executive in charge of sponsor relations and products development, and as such will act as liaison between the Institute and sponsors conducting research at Battelle. A graduate of the University of Arizona,

(Continued on page 89)

Letters to the Editor

Letters to the Editor gives the foundry industry an open forum for the exchange of ideas, facts, opinions, and criticisms on anything related to the industry or of importance to foundrymen. All letters of broad interest which do not violate A.F.S. policy or good taste are publishable. Write to The Editor, American Foundryman, 222 W. Adams St., Chicago 6, Ill. Letters must be signed but will be published anonymously on specific request.

Class Uses Defects Book

I am teaching a course on casting defects and plan to use the A.F.S. book ANALYSIS OF CASTING DEFECTS. Foundrymen in the class come from various foundries—steel, gray iron, brass, malleable, etc. Can I enter a group order for the book and on what terms?

TEACHER

As a member of A.F.S. you can get the book for your students at the Society member price of $2.50 per copy if you enter a group order yourself. Postage will be paid if remittance accompanies order. If 25 or more copies are ordered at one time the price is 20 per cent less. —Editor.

Need More Reliable Formulas

We appreciate the comments and suggestions made by J. E. Rehder in Letters to the Editor in the November issue of AMERICAN FOUNDRYMAN. It is true that in our paper, *"Variables in Producing Nodular Graphite Cast Iron by Magnesium Treatment"* (August, 1949, page 36), considerable emphasis was placed on lower reactivity of magnesium alloy additions at the expense of appearing to go in the wrong direction economically. It should be remembered, however, that relatively few iron foundrymen are familiar with magnesium, its reactivity at temperatures of molten iron, and possible unfortunate results due to improper handling.

We felt it desirable to have less reactive materials available particularly at the start of this work. After the foundry has become familiar with the reaction and procedure of treatment, it is better able to use the higher content magnesium alloys. In spite of the fact that pure magnesium is the most reactive material, we still feel that if safe and relatively efficient methods of treatment can be developed, pure magnesium will be the most economical in many cases.

Mr. Rehder suggests reporting the magnesium efficiency as a function of both its nodulating and desulphurizing action. Certainly there is no objection to this, although with present information available it does not appear to add anything. It seems to us that overall efficiency is the main interest in considering the economics of material usage and this overall efficiency seems to be more a function of alloy composition and method of introduction into the melt than anything else.

What is needed are more reliable empirical formulas for predicting the amount of magnesium which will be consumed in desulphurizing. Such formulas would enable better prediction of the necessary treating charge and a better consistency in attaining residual magnesium in the desired range.

J. C. H. STEARNS
Mgr. Ingot Sales
Dow Chemical Co.
Midland, Mich.

How Do You Price Castings?

We have been thinking about your editorial "Price per Piece—Price per Pound?" in the July issue of AMERICAN FOUNDRYMAN and we do not agree with you.

If you quote on a piece basis you are apt to go wrong on the price. If you estimate your weight too light, you will get the business and if you estimate too heavy, the other fellow will get it. If you quote on a per pound basis there is no chance of going wrong as your customer pays for what he gets.

NON-FERROUS FOUNDRYMAN

Pricing per piece is no better than pricing per pound if the same factors are used in determining cost. Underestimating the weight of the casting or any other factor will lead to error in the result.

GRAY IRON FOUNDER

Pricing of castings is a complex problem. We use the price per pound method when dealing with a fairly large continuous production of one casting, and the price per piece method when referring to a few light castings. The price per pound method involves a wide variety of prices and the small customer does not always enjoy it since he does not consider all of the factors that go into pricing of his castings.

CANADIAN FOUNDRYMAN

When the price per piece policy is used the producer admits the possibility of an error in his casting volume calculation and takes steps to allow for the error. When the price per pound policy is used, the producer indirectly infers that he has no confidence in his estimates on core, molding, cleaning, and metal costs because he distributes his weight error over all those operations. He is placing part of the cost of each operation in the price per pound and not correcting for metal weight only. He penalizes all departments for an error which actually affects only one, the melting department.—from an article by R. L. Lee, Grede Foundries, Inc., Milwaukee, chairman of the A.F.S. Foundry Cost Committee, in *American Foundryman*, April, 1946, page 136.

Coke container about to be emptied into coke storage bin at Buffalo, N. Y., plant of Worthington Pump & Machinery Corp. Other containers are in railroad car. Use of containers to avoid coke breakage, as well as other ideas on coke handling, appeared in a Letter to the Editor from Frank Fones, Whiting Corp., Harvey, Ill., in the November issue of AMERICAN FOUNDRYMAN *in reply to foundrymen seeking handling advice.*

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Members and guests of the A.F.S. Philadelphia Chapter were guests of the Philadelphia Navy Yard at the Chapter's Annual Outing, held October 14. Master Molder George Bradshaw of the Navy Yard was host.

CHAPTER ACTIVITIES NEWS

Central Michigan

F. P. Tobakos
Publicity Chairman

NOVEMBER MEETING technical speaker was E. T. Kindt, Kindt-Collins Co., Cleveland, on *"Comments on Trends of the Pattern Industry."*

Lack of cooperation between patternmakers, Mr. Kindt said, has caused many foundrymen to lose confidence in them. A patternmaker, the speaker said, is judged upon the quality of his product and foundrymen at times order from shops solely upon the strength of the shop's reputation for good work.

The speaker suggested good lighting, good lumber, proper lumber storage, good equipment and placement of equipment as essential to a well-run pattern shop and the production of better patterns. If at all possible, the pattern shop should have its own nonferrous foundry and plaster room, the speaker said.

Mr. Kindt also brought up the subject of standardization of pattern and corebox equipment. As yet, he said, nothing worthwhile has been adopted but there has been talk of standardizing draft, dowel pins, marking of patterns and ears on plates.

The speaker said he felt that plastics will in the near future replace some of the pattern materials now in use. Plastics, he said, offer the advantages of hardness, easy cutting, no shrinkage, no coating and resistance to wear.

Mr. Kindt closed his talk by stating that the demand for new economical production of castings is a challenge to every patternmaker. Patternmakers must cooperate with each other, with foundries, machine shops and suppliers. The responsibility of advancing the craft depends on each and every pattern maker and owner of shops, the speaker concluded.

Special guest for the evening was W. A. Geisler, foundry managing director of the Goetzewerke, Dusseldorf, Germany. Mr. Geisler gave a short but interesting talk on the conditions of the foundries in Germany during the past war and at present.

Herbert Green, Battle Creek Pattern Works, Battle Creek, was in charge of the technical session and the discussion that followed Mr. Kindt's talk.

Prof. Charles Sigerloos, past chapter chairman, gave a short report on the progress made to date in securing a student chapter at Michigan State.

Central Illinois

John R. Nieman
Caterpillar Tractor Co.
Chapter Reporter

GUEST SPEAKER at the November 7 meeting, held at the Jefferson Hotel, Peoria, was Lester B. Knight, Lester B. Knight & Associates, Inc., Chicago, who discussed essential considerations for mechanization—(1) analyze the

Interested listeners during a talk by A. W. Gregg, Whiting Corp., Harvey, Ill., were MIT Student Chapter members at their November meeting.

problem, (2) establish mission, (3) integrate operations, and (4) retrain personnel for mechanization.

"Mechanization," he said, "is a challenge to, not a substitute for management." All interferences with production are within the control of supervision, and the importance of anticipatory thinking by management and supervision was stressed by the speaker. Mechanization cannot be effective when limited to production lines. It should be extended to include cost systems, the measured work day, or wage incentives, and good housekeeping. The days of the man who wears his hat three ways are gone. One man cannot effectively be the foundry engineer, the foundry metallurgist, and the factory manager, Mr. Knight said.

W. J. MacNeill, Dayton Malleable Iron Co., Dayton, Ohio, who is active in the Foundry Educational Foundation, gave a coffee talk. Mr. MacNeill outlined the value of a vigorous foundry educational program and said that it is vital to the foundry industry to keep in step with advances being made by competitive fabrication methods.

Central Illinois

John R. Nieman
Caterpillar Tractor Co.
Chapter Reporter

GUEST SPEAKER at the October 3 dinner meeting, held at the Jefferson Hotel, Peoria, was L. D. Harkrider of the General Malleable Corp., Waukesha, Wis., who described *"Europe As I Saw It."*

In 1948, Mr. Harkrider, president of the Wisconsin Manufacturers' Association, toured Europe as a member of a trades group sponsored by the W.M.A. He was able to exchange views with manufacturers in England, Norway, France, Denmark, Belgium, and Luxemburg.

Mr. Harkrider's statements on European industrial recovery stimulated worthwhile discussion.

Birmingham District

J. P. McClendon
Stockham Valves & Fittings
Publicity Chairman

A DOUBLE FEATURE marked the first meeting of the 1949-50 season, held October 21 at the Tutwiler Hotel. Joint speakers were W. R. Jaeschke, Whiting Corp., Harvey, Ill., and Dr. J. T. Mackenzie, American Cast Iron Pipe Co., Birmingham.

Mr. Jaeschke used a number of slides to illustrate his talk on *"Mechanization of the Cupola,"* in which he described developments from hand-charged to mechanically-charged cupolas.

The speaker complimented Birming-

Chapter Vice-President Fred J. Pfarr, Lake City Malleable Co., Cleveland, and Speaker William T. Bean, Jr., Detroit foundry consultant, photographed at a recent meeting of the Northeastern Ohio Chapter.

Speaker Edward McFaul of Midwest Institute, Chicago, left, and Chapter Chairman Lyle H. Clark, Buick Motor Div., GMC, at Saginaw Valley Chapter's "Suppliers' Night," held November 3 in Frankenmuth, Michigan.

Deep in a steel round table discussion at the Texas Chapter's October 21 meeting, Houston, were, left to right: C. K. Flagg, Federal Steel Products, Houston; W. J. Temple, K. O. Steel Castings Co., San Antonio; and Chapter Vice-Chairman W. H. Lyne, III, of Hughes Tool Co., Houston.

ham foundrymen on the modern cupola installations in the area. He concluded his address by showing pictures of a modern S-type swivel type charger now in use in a Birmingham foundry, and presented a 15-minute sound film, *"Yard to Cupola."*

Preceding the technical talk, Dr. Mackenzie, a member of the Board of Directors of the Foundry Educational Foundation, spoke on FEF programs, particularly in Alabama.

A dream of the Birmingham District Chapter's Educational Committee was realized this fall with opening of a completely-equipped foundry building at the University of Alabama. The total investment in plant and equipment approximates $75,000, Dr. Mackenzie said. The speaker introduced Harold M. Gade, assistant professor, department of metallurgical engineering, and Robert Oliver, foundry student, University of Alabama.

Harry H. Kessler of Sorbo-Mat Process Engineers, St. Louis, speaking on gating and risering practices at the October 18 meeting of the Eastern New York Chapter, Lathams.

FUTURE CHAPTER

● ***DECEMBER 15***
WESTERN MICHIGAN
Spring Lake Country Club
CHRISTMAS PARTY

● ***DECEMBER 16***
NORTHWESTERN PENNSYLVANIA
Grotto Club Annex, Erie
CHRISTMAS PARTY

OREGON
Heathman Hotel, Portland
STAG CHRISTMAS PARTY

TRI-STATE
Alvin Hotel, Tulsa, Okla.
W. B. GEORGE
R. Lavin & Sons, Inc.
"Metallurgy in the Brass Foundry"

● ***DECEMBER 17***
CINCINNATI DISTRICT
Netherland Plaza Hotel, Cincinnati
CHRISTMAS PARTY

TWIN CITY
Nicollet Hotel, Minneapolis
ANNUAL CHRISTMAS PARTY

● ***JANUARY 3***
MICHIANA
LaSalle Hotel, South Bend, Ind.
Films: *"Foundry Chaplets"* and *"Foundry Chills."*

● ***JANUARY 4***
TOLEDO
Toledo Yacht Club
J. CAUFFIELD
St. Clair Bronze Co.
"Foundry Costs"

● ***JANUARY 9***
CENTRAL OHIO
Chittenden Hotel, Columbus
R. A. WITSCHEY
A. P. Green Fire Brick Co.
"Foundry Refractories"

● ***JANUARY 9 (Cont'd)***
METROPOLITAN
Essex House, Newark, N. J.
Round table discussion: *"Melting Practice"*

CENTRAL ILLINOIS
Jefferson Hotel, Peoria
CHARLES B. SCHUREMAN
National Lead Co.
"Foundry Sands"

CENTRAL INDIANA
Athenaeum, Indianapolis
ROBERT P. SCHAUSS
Illinois Clay Products Co.
"Gating and Feeding"

WESTERN MICHIGAN
Cottage Inn, Muskegon
C. S. FOSTER
Eastman Kodak Co.
"Color Photography and Polarized Light in Metallography"

CINCINNATI DISTRICT
Engineering Society, Cincinnati
S. D. MARTIN AND C. BRAUN
Central Foundry Div., GMC
"Time and Motion Study"

● ***JANUARY 10***
ROCHESTER
Hotel Seneca, Rochester
WILLIAM M. BALL, JR.
R. Lavin & Sons, Inc.
"Effective Essentials Required in Making Non-Ferrous Castings"

N. ILLINOIS - S. WISCONSIN
Faust Hotel, Rockford, Ill.
HARRY J. JACOBSON
Industrial Pattern Works
"Patterns and Core Boxes"

M. I. T.

Richard A. Poirier
Technical Secretary

THE FIRST MEETING of the student chapter, held November 19, featured as its speaker A. W. Gregg, Whiting Corp., Harvey, Ill., whose subject was *"Ferrous Melting Furnaces."*

Mr. Gregg opened his talk with a brief outline of the tonnage produced by the different segments of the foundry industry, the type of furnaces used by each type of foundry and the tonnages produced by these furnaces.

Slides were shown to enable Mr. Gregg to describe the operation of the equipment used throughout the industry. The first slides explained the construction and operation of the cupola. These were followed by a description of the air-blast control equipment. Special interest was shown in the discussion of the newer hot-blast and oxygen enriched type cupolas.

Several different types of mechanical charging equipment were shown, illustrating the labor saving economies of each. The various types of dust collectors were explained and illustrated. The remaining slides illustrated the electric, open-hearth, converter, induction, and malleable air furnaces.

Mr. Gregg concluded his talk with a movie on Whiting mechanization equipment with special emphasis on the charging methods. Throughout his talk Mr. Gregg stressed the need for an economically sound reason to purchase any new equipment.

The meeting closed with the usual question period and a short talk on Mr. Gregg's recent visit to Holland.

Ontario

C. H. Johnston
E. Long, Ltd.
Chapter Director

THE SECOND MEETING of the season was held at the Royal York Hotel, Toronto, October 28.

Chapter Chairman J. H. King, Werner G. Smith, Ltd., Toronto, presided at a panel on *"Foundry Sands."*

A special committee was formed and a questionnaire was sent out to foundries for problems on sand. The committee dealt with the questions received at a special session and various members were delegated to answer the questions submitted.

Rolph Barnes of Wm. R. Barnes Co., Ltd., Hamilton, gave a very interesting talk on the development of Canadian sands and also showed slides of the Wm. R. Barnes Co., Ltd.'s sand handling plant at Waterdown, Ont.

MEETING PROGRAMS

● ***JANUARY 10 (Cont'd)***

CHICAGO
Chicago Bar Association
ROUND TABLE MEETINGS (Note change from regular meeting night)

TWIN CITY
Covered Wagon, Minneapolis
Subject and speaker to be announced.

● ***JANUARY 13***

NORTHEASTERN OHIO
Tudor Arms Hotel, Cleveland
WALTER E. SICHA
Aluminum Co. of America
Film: *"Fluid Flow in Transparent Molds"*

WISCONSIN
Schroeder Hotel, Milwaukee
S. C. MASSARI
A.F.S. Technical Director
Film: *"Fluid Flow in Transparent Molds"*

PHILADELPHIA
Engineers' Club, Philadelphia
NORMAN A. BIRCH
American Brake Shoe Co.
"Principles of Risering"

EASTERN CANADA
Mount Royal Hotel, Montreal
H. J. SALZBERG
Borden Co.
"Plastic Binders"

● ***JANUARY 14***

CENTRAL NEW YORK
Onondaga Hotel, Syracuse
STAG PARTY

● ***JANUARY 16***

QUAD CITY
Ft. Armstrong Hotel, Rock Island, Ill.
HARRY KESSLER
Sorbo-Mat Process Engineers
"Gates and Risers"

● ***JANUARY 18***

CENTRAL MICHIGAN
American Legion Clubhouse, Battle Creek
B. P. MULCAHY
Fuel Research Laboratory, Inc.
"Cupola Operations"

● ***JANUARY 19***

DETROIT
Rackham Memorial, Detroit
THOMAS E. BARLOW
Eastern Clay Products, Inc.
"Effect of Sand Variables on Scrap Losses or Good Castings from Bad Sands and the Reverse"

● ***JANUARY 20***

WESTERN NEW YORK
Meeting place to be announced
ANNUAL STAG PARTY

TRI-STATE
Tulsa, Okla.
Film: *"The Drama of Steel"*

WASHINGTON
Gowman Hotel, Seattle
J. E. REHDER
Canadian Bureau of Mines
"Nodular Iron"

● ***JANUARY 23***

NORTHWESTERN PENNSYLVANIA
Moose Club, Erie
FRED G. SEFING
International Nickel Co.
Subject to be announced

● ***JANUARY 27***

ONTARIO
Royal Connaught Hotel, Hamilton
GROUP MEETINGS

CHESAPEAKE
Engineers' Club, Baltimore
T. E. EAGAN
Cooper-Bessemer Corp.
"Nodular Iron"

Chicago

Paul Skirha, Jr.
Crane Co.
Chapter Reporter

SIMULTANEOUS round table sessions were featured at the Chapter's November 7 meeting, held at the Chicago Bar Association.

Preceding the sessions, Prof. Roy W. Schroeder of the University of Illinois, Navy Pier Branch, Chicago, introduced and presented certificates of membership in A.F.S. to five Chicago high school foundry instructors: George A. Davis, Crane Technical High School; John F. Dix, Austin High School; R. L. Drdla, Schurz High School; and Paul F. Hoffman and Joseph S. Turek of Tilden Technical High School.

G. A. Lillieqvist, American Steel Foundries, East Chicago, Ind., speaking on molten steel temperatures at the steel division round table, discussed fluidity curves between grade B and intermediate manganese steels with temperatures ranging from 2750 to 2930 F. Temperature is one of the most important factors influencing fluidity and surface finish of castings, the speaker said.

Manganese steel, he said, will flow farther than grade B steel at the same temperature, adding that basic open hearth steel has the lowest fluidity and acid electric furnace steel the highest. Use of temperature control equipment will pay dividends in quality, the speaker concluded.

Malleable round table meeting speaker W. G. Ferrell, Auto Specialties Mfg. Co., St. Joseph, Mich., discussed the advantages of hot blast and humidity control in the cupola—(1) minimized bridging, (2) fuel conservation, (3) decreased melting losses, (4) uniform analysis, (5) increased melting rate, and (6) easier annealing of iron.

Fred B. Skeates, Link-Belt Co., Chicago, spoke to a combined round table of pattern and gray iron men, on pattern equipment for non-productive purposes. Foundries, the speaker said, should have a pattern designer who can instruct patternmakers in designing and gating of patterns. The speaker recommended use of split patterns in foundries where skilled molders are not available.

Clyde A. Sanders, American Colloid Co., Chicago, speaking on grain sand distribution at the November 1 meeting of the Ohio State University Student Chapter.

Non-ferrous round table speaker Wayne Martin, Jobbins Aluminum Co., Aurora, Ill., stressed gating methods for avoiding porosity in aluminum casting. Among points cited by Mr. Martin were that gates and risers should be in the cope, while the runners should be in the drag; gating should be arranged so that the last metal into the mold enters the riser; and use of a square, big-end down sprue to prevent formation of a vortex that will entrap air.

Texas

E. P. Clark
American Wheelabrator & Equipment Corp.
Chapter Reporter

ROUND TABLE discussions on modern foundry practices were features of the October 21 meeting of the Chapter, held at the Texas State Hotel, Houston.

Each group—Gray Iron, Steel and Non-Ferrous—had a separate room for its discussion. Chairmen and discussion leaders were:

Steel—C. K. Flagg, Federal Steel Products, Houston, chairman; W. J. Temple, K. O. Steel Castings Co., San

Speakers and discussion leaders at the Canton District Chapter's November 3 round table meeting were, seated, left to right, Chapter Chairman George M. Biggert, United Engineering & Foundry Co., Canton, and Coffee Talker Paul Ebert, Ohio Boxboard Co., Rittman. Standing, left to right, Harold Biddinger and Edward F. Kipp, both of F. E. Myers Co., Ashland; M. G. Winters, Winters Foundry Co., Canton; Ernest Lancashire, Union Metal Mfg. Co., Canton; R. E. Mittlestead, Electromelt Co., Barberton.

Antonio, discussion leader; F. G. Huber, Able Supply Co., Houston, refractories; and P. B. Croom, Houston Pattern Works, patternmaking.

Gray Iron—Robert Lang, Lufkin Foundry & Machine Co., Lufkin, chairman; R. Whitlinger, Pioneer Foundry, Houston, discussion leader; W. A. Bittel, Royal Fire Brick & Supply Co., refractories; and Joseph Wolf of the Wolf Pattern Works, Houston, Patternmaking.

Non-Ferrous—J. Collier, Garrott Brass & Machine Co., Houston, chairman; Jake Dee, Dee Brass Foundry Co., Houston, discussion leader; Henry Creeger, Electro Refractories Co., Houston, refractories; and O. M. Bartholomew, Hughes Tool Co., Houston, patternmaking.

Eastern Canada

A. J. Moore
Montreal Bronze, Ltd.
Chapter Reporter

NODULAR IRON and its applications as an engineering material was the subject of a talk by J. E. Rehder, Canadian Bureau of Mines, speaking at the October 14 meeting.

Comparing nodular iron with gray and malleable iron, Mr. Rehder said that nodular iron in the as-cast state contains free graphite, as do gray and malleable iron, but its main difference lies in its graphite formation. In cast iron, the speaker said, the graphite occurs in flake form and is distributed at random through the matrix, thus exerting a particular effect upon its physical properties. Elongation is very little but damping capacity is excellent. Graphite in nodular iron, Mr. Rehder said, is spherical and gives iron mechanical properties similar to those of cast steel in strength and elongation, coupled with good machinability.

Nodular iron, the speaker said, can be produced from a cupola, electric furnace or other melting equipment and by ladle additions of cerium, mischmetal or magnesium master alloys. Ladle treatment is followed by a ladle inoculation of silicon alloys at 0.40 per cent silicon, Mr. Rehder said.

Various copper, nickel, ferro-silicon or magnesium master alloys are used to minimize the violence of the reaction of molten iron poured over pure magnesium, Mr. Rehder said. The recovery of magnesium is low. The speaker recommended a 50/50 alloy, stating that use of lower magnesium content master alloys is likely to produce an unwanted build-up in copper or nickel remelts.

Mr. Rehder recommended this composition: carbon, 3.50 to 3.70 per cent; silicon, 2.60 to 2.80 per cent; manganese, 0.40 per cent maximum; phosphorous, 0.15 per cent maximum; with sulphur as low as possible for economy.

The speaker said that a tensile strength up to 105,000 psi can be developed with some ductility and a range of mechanical properties can be obtained by varying heat treatments. Annealing treating develops ferritic structure, Mr. Rehder said, which shows 15 to 20 per cent elongation and 65,000-75,000 psi tensile strength.

Northwestern Pennsylvania

Earl M. Strick
Erie Malleable Iron Co.
Chapter Secretary

ONE OF THE LARGEST turnouts in chapter history heard Clyde A. Sanders, American Colloid Co., Chicago, speak on *"Does Sand Cause Metal Shrinkage?"* at the October 24 meeting, held at the Moose Club, Erie.

The speaker explained sand handling variables that must be controlled in order to prevent metal shrinkage and to produce uniform castings. Harold Lolley, Bucyrus-Erie Co., led a discussion following the talk.

Chapter Chairman Joseph A. Shuffstall, National-Erie Corp., Erie, welcomed large delegations of foundrymen

Part of the group of foundrymen and their guests attending the Timberline Chapter's first meeting of the Year, held September 26 in Denver.

from National Bearing Division, American Brake Shoe Co., Meadville, Pa., and from Cooper-Bessemer Corp., Grove City, Pa. Among other visitors from Buffalo and Cleveland was John R. Wark, Queen City Sand & Supply Co., Buffalo, chairman of the A.F.S. Western New York Chapter.

Preceding the regular technical session, representatives of the Erie Malleable Iron Co., Erie, presented the Malleable Founders' Society's new motion picture, *"This Moving World."* A change of date and meeting place was announced for the chapter's Annual Christmas Party, which will be held December 16 at the Grotto Club Annex, Erie.

Central Michigan

F. P. Tobakos
Publicity Chairman

OCTOBER MEETING speaker was Bradley H. Booth, Carpenter Bros., Inc., Milwaukee, whose subject was *"Foundry Sand Practices."*

Mr. Booth began by listing the various sand deposits in Eastern and Central United States and the types of sand found in each. With the aid of colored slides he then gave a brief description of the mining and processing operations used in obtaining the sand.

Methods of sand transportation were discussed. At present, sand is shipped by truck, box-car, boat and hopper bottom gondolas. Mr. Booth predicted the latter method will come into greater use in the future due to the short unloading time required.

During the question session which followed his discussion, Mr. Booth pointed out that even the smallest foundry should have a small sand laboratory with equipment for the following tests; (1) screen and clay, (2) green compression, (3) permeability and (4) moisture.

The technical session was preceded by the Malleable Founders' Society's new film, *"This Moving World,"* illustrating the malleable iron industry.

Canton District

Alexander Prentice
Stark Foundry Co.
Chapter Reporter

SEVENTY-FIVE MEMBERS and their guests met at the Chapter's second dinner meeting of the season, held in the Elk's Club, Alliance, Ohio, November 3, for round table discussions on steel, gray iron, non-ferrous castings and patterns.

Leaders of the round table discussion groups were: *Steel,* R. E. Mittlestead, Electromelt Co., Barberton, Ohio; *Gray Iron,* Ernest Lancashire, Union Metal Mfg. Co., Canton: *Patterns,* Harold Biddinger and Edward F. Kipp, F. E.

(Continued on Page 82)

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WASHINGTON CHAPTER *Secretary,* F. R. Young, E. A. Wilcox Co., 517 Arctic Bldg., Seattle 4, Wash.

WESTERN MICHIGAN CHAPTER *Secretary,* Ross Shaffer, Lake Foundry & Machine Co., First and Water Sts., Muskegon, Mich.

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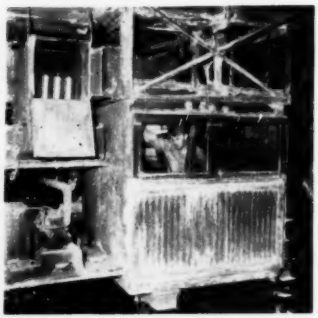
NEW Foundry Products

Readers interested in obtaining additional information on items described in New Foundry Products should send requests to Reader Service, American Foundryman, 222 W. Adams St., Chicago 6, Ill. Refer to the item by means of the convenient code numbers.

Crane Air Conditioner

DC1—W. B. Connor Engineering Corp. announces development of an air conditioning unit that will maintain cool, even temperatures in foundry crane cabs. An activated carbon air recovery installation



removes dust and fumes, giving operator clean, fresh air. Illustration shows access door of air conditioning unit open and dust filter removed to reveal carbon-filled canisters for soaking up gases.

Blast Cleaning Mill

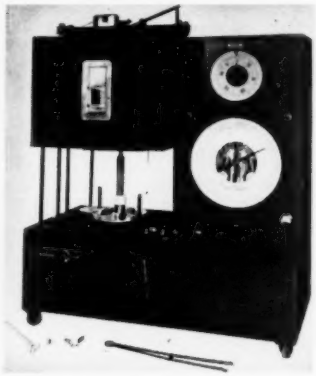
DC2—Redesigned to incorporate new features and improvements, American Wheelabrator & Equipment Co.'s 48 x 48 in. Wheelabrator Tumblast has an operating load capacity of 20 cu ft and is particularly adaptable to steel foundries where difficult blast cleaning conditions are encountered. Bulletin No. 134-A, complete with photographs, drawings and data on construction and specifications of the redesigned machine is available.

Pattern Plastic

DC3—A new pattern plastic for use in precision casting, Ard-Lustrex 15K, developed by the A.R.D. Corp., is designed to meet demands for better dimensional stability and easier handling of patterns at a marked saving in material cost, according to the manufacturer. Ard-Lustrex 15K can be molded in cast molds costing no more than wax mold equipment, and at low pressures, such as are available in any wax molding machine. Patterns can be handled without particular care and stored indefinitely without danger of distortion and pattern assembly is done by same methods as those used in wax patterns but requires no great care in manipulation. In drying and firing no mold cracks will result, no burning will take place within the mold and no ash is left after firing, manufacturer states. Detailed technical data is available on request.

High-Temperature Tester

DC4—Harry W. Dietert Co. announces development of a new high-temperature testing machine for foundry sand and ceramic materials, the No. 753 Dietert-Detroit Thermolab. The Thermolab is a compact, high-temperature laboratory engineered to facilitate determination of such physical properties as expansion, hot strength, retained strength, hot permeability, hot gas pressure, core collapsibility, spalling and hot deformation. Instrument



utilizes a precision weighing mechanism with large load dial to measure load applied to sand or other material under test. Dial is graduated to read psi directly to .05, 0.5 and 5.0 lb in the 0 to 50, 0 to 500 and 0 to 5000 lb ranges respectively. An accuracy of 0.2 per cent is maintained throughout. Large sliding door, with observation port, provides easy access to furnace chamber.

Electronic Air Cleaner

DC5—Electronic air cleaners for foundry and steel mill use, the Westinghouse Electric Corp.'s Precipitrons, are rated at 16,000 cfm at a cleaning efficiency of 90 per cent—36 tons of air per hour. Energized power pack collects dirt on Precipitron louvers. When collector plates are full, single control takes unit out of service, closes the louver, washes the cell bank thoroughly, applies fresh adhesive and puts unit back in service.

Brinell Hardness Reader

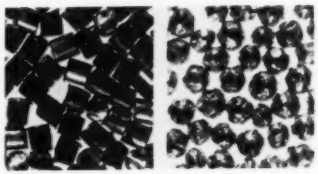
DC6—Eberbach & Son Co.'s new direct reading Brinell hardness reader eliminates inaccuracies due to parallax and readings are not distorted by fins or rough surface on reverse side of the test piece. Operator makes Brinell impression on any machined, rough ground or cast surface, presses the tester into the impression and reads the Brinell hardness number directly on the dial. Small enough to be carried in the pocket, the tester requires no operator judgment or skill.

Face Shield

DC7—Face protection with unobstructed vision is provided to workers handling chemicals, pouring metals, and doing sanding and grinding by the M.S.A. De-Luxe Faceshield, developed by the Mine Safety Appliances Co. The Faceshield consists of a large area visor, 19 in. wide x 9 in. deep, of non-inflammable vinyl plastic which extends completely around the face, covering the ears and extending below the chin. Available in thicknesses of .020, .040 and .060 in., the visor is snap-fastened to a hard fiber sparkguard which shields the forehead. Adjustable to any head size.

Peening and Cleaning Shot

DC8—Cutwire Shot for peening and cleaning, manufactured by the Precision Shot Co., is made from high-quality SAE 1065 wire for high tensile strength, hardness (46-52 rockwell) and maximum fatigue resistance and is available in .014 to .072 in. diameters. Life of cutwire shot



is claimed to be 1500 cycles. Other advantages claimed are uniformity of physical properties and of size, and savings up to 40 per cent in machine maintenance. Cutwire shot deforms into a full round shape of uniform size, which is maintained for 98 per cent of its period of use.

Band Saw

DC9—A portable, low-cost metal cutting band saw developed by the Machine Tool Div., Kalamazoo Tank & Silo Co., cuts angles, bars, tube and pipe up to a capacity of 6 x 10 in. Exclusive features include: four cutting speeds from 53 to 266 fpm; a hydraulic dash-pot mechanism to insure controlled pressure from beginning to end of cut; blade mounting from top for half-minute blade changes; unobstructed view of cutting operations; and double sets of blade cleaning brushes. Stand has four legs for stability. Motor mounting takes any standard motor. Total weight of saw and motor is 198 lb.

Laboratory Furnace

DC10—Laboratory Equipment Corp.'s No. 100 combustion furnace is designed to operate up to temperatures of 2800 F. Furnace proper has approximately double the insulation found in other furnaces and is housed in a low radiating heavy sheet aluminum shell, lessening heat loss, manufacturer claims. No. 100 furnace is designed for carbon and sulphur analyses, where materials are difficult to combust, and where speed is desired. Furnace is 14 in. high, 15½ in. wide, 13¾ in. deep. Standard power unit operates on 220 volts, single-phase, 60-cycle current. Power units can be supplied for other voltages and cycles.

Woodworking Machine

DC11—More than 125 different woodworking applications are claimed for the Delta Multiplex, manufactured by the Delta Mfg. Div., Rockwell Mfg. Co., and which features an engineering design utilizing two instead of the usual three circular movements found in the radial woodworking machines. Known as the double radial action, this design works at a center pivot position above the saw

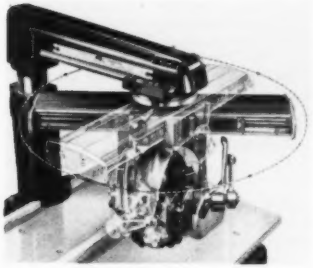


table. It is possible to locate the motor power in any position, even vertically, above the work table. Any kind of rotary cutting tool can be attached to spindle.

Heavy Duty Hoists

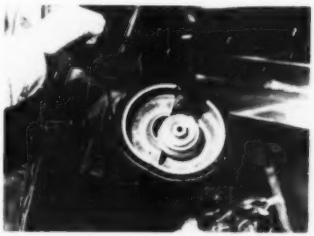
DC12—A complete new line of Auto-Bloc heavy duty, lightweight hoists is announced by David Round & Son. According to the manufacturer, these hoists, while matching conventional light duty units in portability, incorporate the strong construction features essential to heavy duty work. Features are simplified hoisting mechanism, unbreakable cover and high quality heat-treated steel construction. Available in 16 standard models of ½ to 40 ton capacities. Every hoist is factory tested for 50 per cent overload.

Permeability Tester

DC13—Precision Scientific Co.'s Permtester measures the time required for a definite volume of air at a fixed pressure to pass through a standard test specimen in making permeability tests. The Permtester may be used directly in the foundry for routine production control or in the laboratory for investigation of new materials and procedures. Readings on dial of timer are in standard values, and do not require computations. Shipped complete, with 1 lb mercury. Dimensions are 14 in. wide x 15 in. high. Weight: 7½ lb.

Drum Sander

DC14—Polishing and buffing abrasives in endless belt form can be used in strip form on a new type buffer drum developed by the American Diamond Saw



Co. to permit use of less-expensive strip abrasives. The Cone-Loc Drum Sander, claimed by the manufacturer to effect 75 per cent savings in abrasives, is a split drum cushioned with rubber, with the halves of the drum locked into a solid drum by a cone-type washer. Standard width abrasives, available in roll form, are wrapped around the drum and secured. Wheel does not lose diameter or require dressing. Abrasive cloth in various grits can be quickly interchanged to accommodate rough or fine work. Available in sizes from 6¼ to 12 in. diameter in various standard widths and bores. Felt cushioned sander optional.

Car Shakeout

DC15—A lightweight car shakeout announced by the Robins Conveyors Div., Hewitt-Robins, Inc., is completely different in design from the HD Robins car shakeout first presented some four years ago. The new unit is capable of loading up to 15 hopper-bottom cars of granular material in a day. With hoist, yard crane or any device capable of lifting its 3½-ton weight, the new Model GS is placed on the car, not attached to it, and the press of a button starts it in operation—another button stops it when car is unloaded. Entire cycle of operation is completed in a few minutes per car.

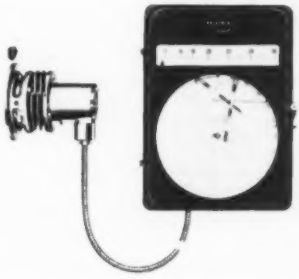
Eye Sweep

DC16—Redesigned in a de luxe model, General Scientific Co.'s Eye Sweep is a professional instrument designed to remove metal and other foreign particles from the eye. Made entirely of stainless steel, the Eye Sweep has a powerful magnet on one end for picking up iron or steel particles not imbedded in the sur-

face of the eye. The other end is a wire loop for non-magnetic particles. Each end is protected by a screw-on cap and parts may be sterilized without affecting the magnet. Clip is provided for convenient carrying.

Radiation Pyrometer

DC17—The Pyrovisor, a new radiation pyrometer developed by the Bristol Co., is designed for recording, indicating or controlling temperatures up to 4000 F in furnaces and kilns. Temperature sensitive head is mounted on side of furnace, away from hot zone, and picks up radiant energy emitted from surface of object being measured. In this way, actual surface



temperature measurements are obtained rather than furnace atmosphere temperatures. Extremely rapid response and a 99 per cent response to temperature change within one second is claimed by the manufacturer.

Sectional Conveyor

DC18—Lattice and channel frame style sectional conveyors, newly-developed by the George Haiss Mfg. Co., Inc., Division

(Continued on Page 92)

FOUNDRY Literature

Readers interested in obtaining additional information on items described in Foundry Literature should send requests to Reader Service, American Foundryman, 222 W. Adams St., Chicago 6, Ill. Refer to the items by means of the convenient code numbers.

Grinding Wheels

DC101—Bayflex wheels for power sanders, bench grinders, cut-off machines, flexible shaft grinders and buffing heads are described in Bay State Abrasive Products Co.'s newly-published four-page folder. Photographs illustrate applications of the various types of wheels and power requirements, recommended speeds, and standard stock sizes and grits available for immediate delivery are given.

Laboratory Equipment

DC102—Vol. 8, 1949, of the *Waco Catalyst*, published by the Wilkens-Anderson Co., contains photographs, descriptions and prices of the company's line of laboratory supplies and chemicals. Included are data on stoppers, tubing, test papers, midget pumps, mantles, controllers, timers, hammer mills, weighing and refining equipment, pipettors, tubes, ovens, sterilizers, balances, etc.

Corrosion Resistant Castings

DC103—A bulletin on corrosion resistance of stainless, monel and nickel castings, published by the Cooper Alloy Foundry Co., contains data designed to aid materials engineers in selecting alloys when corrosive conditions and agents are unknown. Listed are resistances of each metal to acids, oxidizing acid salts, wet and dry gases, organic materials, alkalies, neutral and alkaline salts, corrosive waters and food and associated products. Also given is a table containing nominal compositions of alloys covered in the data sheet.

Automatic Control Systems

DC104—Ace Instrument Co., Inc.'s new 16-page bulletin on automatic combustion control, C-22, describes and illustrates steam pressure regulators, air flow regulators, draft regulators, electric power units and sequence draft regulators. Operation and maintenance, applications and specifications of each instrument are given, as are typical regulator arrangements and a description of packaged controls.

Crane Cab Air Conditioning

DC105—A new bulletin describing air conditioning systems for crane cabs operating in hot or contaminated atmospheres is announced by the Dravo Corp. The bulletin describes in detail the various requirements for air conditioning of crane cabs and explains the mechanical and functional features of Dravo equipment. Specification data sheets are included for three different models. Literature may be obtained without charge by writing for Bulletin 300. Tables show temperature conditions and maximum allowable concentration of gas, vapor, mist and dust. Written by Richard H. Darrah of Dravo, the bulletin is reprinted from an article appearing in the March, 1949, issue of *Iron and Steel Engineer*, and contains discussions on Mr. Darrah's paper by several heating and ventilating engineers.

Plaster Mold Casting

DC106—"Casting to ±.005 In." is the title of a new booklet on plaster mold casting published by the Eclipse-Pioneer Div., Bendix Aviation Corp. Photographs of precision castings made by the plaster mold process at Bendix show the close tolerances, smooth finishes, thin walls, symmetry, uniform physical properties and difficult casting shapes achieved.

Refractory Ware

DC107—Laboratory Equipment Corp.'s new catalog of Leco Zircon Refractory Ware lists combustion tubes and liners, stock size tubes, combustion boats and shields, ignition ware, incinerating dishes, melting crucibles, brazing crucibles, refractory and hearth plates, flame rings and collars, triangles, heating cores, and perforated discs. Materials, specifications and a complete price list are given. Also given are properties of Leco Zircon products.

Malleable Castings

DC108—A booklet describing the advantages of malleable iron castings, published by the Maumee Malleable Castings Co., serves as a handy reference for purchasing agents and engineers. The booklet contains 17 photographs showing operations in various stages of malleable castings production and illustrations of 44 typical castings produced at Maumee.

Bonded Disc Wheels

DC109—Raybestos-Manhattan, Inc.'s Bulletin 6901-A describes the Manhattan Moldisc, a new bonded disc wheel for rotary sanders. Advantages listed in the bulletin are longer life, uniform cutting action, increased production, reduced grinding costs, greater ease in handling, less operator fatigue and greater safety. Manufacturer claims the Manhattan Moldiscs have fast, free cutting qualities for fabricating stainless steel and other alloys requiring grinding without generation of excessive heat and that its flexibility makes it possible to produce superior finishes.

Scottish Steelfounding

DC110—Handsomely bound and illustrated is a booklet describing the various phases of steel casting at Carntyne Steel Castings Co., Ltd., Renfrew, Scotland. Detailed photographs show molding, finishing, heat treating control and patternmaking processes at this large Scottish foundry, which produces steel castings weighing up to 10 tons for locomotives, suction dredgers, ships, winders and various types of machinery. Copies are available to readers of AMERICAN FOUNDRYMAN in limited quantities without charge.

Copper Shot

DC111—American Wheelabrator & Equipment Corp.'s New Bulletin 69 describes the advantages of copper shot in cleaning and finishing non-ferrous castings. Such advantages as natural color finishes, no imbedding of hard abrasive in soft non-ferrous parts, no subsequent rusting or staining, no contamination of non-ferrous melts from iron abrasive in remelt material and greatly increased life of wearable blast cleaning machine parts are cited in the bulletin. Performance results are enumerated, showing advantages in appearance and costs.

Portable Air Tools

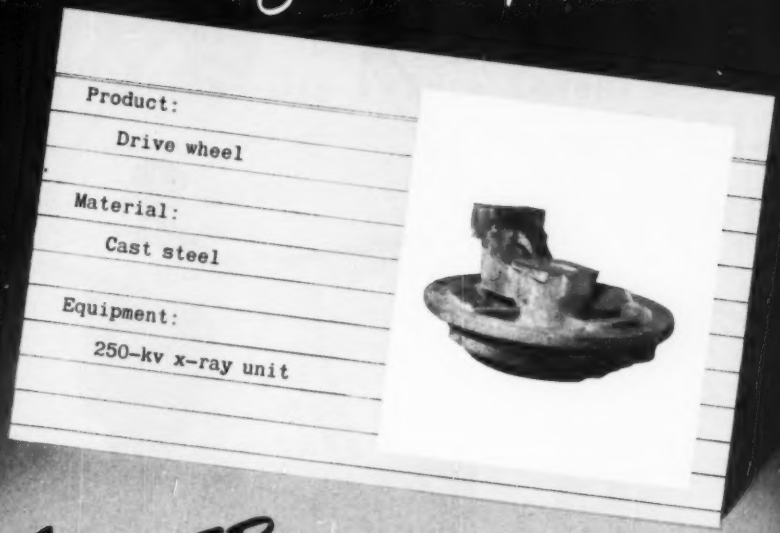
DC112—Publication of a 44-page catalog featuring a completely redesigned line of Stream Power Portable Air Tools is announced by the Buckeye Tools Corp. The catalog is produced in convenient, looseleaf form to permit addition of specification sheets on tools now under development. Informative data on air pressures and air tool efficiency are included in the catalog. Copies are available without obligation upon request.

Conveyor Analysis Charts

DC113—Offered together with a folder illustrating the Logan Co.'s line of conveyors, chutes and lifts, are three types of convevor analysis work sheets—"Savings," "Where to Look," and "Dollar Cost," de-

(Continued on Page 93)

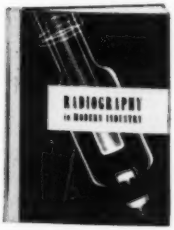
What's the right X-Ray film?



ANSWER:

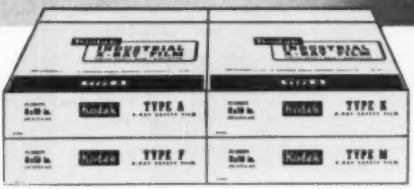
KODAK INDUSTRIAL X-RAY FILM, TYPE F

Because the equipment had only moderate power and section thicknesses up to 3¼ inches were to be examined, the radiographer chose Kodak Industrial X-ray Film, Type F, exposed with Kodak Industrial X-ray Intensifying Screens. This film is designed for use with fluorescent screens to provide maximum speed. The combination is essential in boosting equipment capacity to handle a heavy job like this. And, since the examination is for gross defects, speed is more important than sensitivity to very fine detail.



RADIOGRAPHY IN MODERN INDUSTRY

A wealth of invaluable data on radiographic principles, practice, and technics. Profusely illustrated with photographs, colorful drawings, diagrams, and charts. Get your copy from your local x-ray dealer—price $3.



A TYPE OF FILM FOR EVERY PROBLEM

To provide the recording medium best suited to any combination of radiographic factors, Kodak produces four types of industrial x-ray film.

Type F gives the highest available speed and contrast when exposed with calcium tungstate intensifying screens. Has wide latitude with either x-rays or gamma rays, exposed directly or with lead screens.

Type M provides high contrast and exceptional detail under direct exposure or with lead-foil screens. It has extra-fine grain, and speed is adequate for radiography of light alloys at moderate kilovoltages and for much million-volt work.

Type A offers high contrast with about three times the speed of Type M, but with slightly more graininess. Used direct or with lead-foil screens for study of light alloys at lower kilovoltages, and of heavier steel parts at 1,000 kv and with gamma rays.

Type K has medium contrast with high speed. For gamma ray and x-ray work where highest possible speed is needed at available kilovoltage without use of intensifying screens.

EASTMAN KODAK COMPANY
X-ray Division · Rochester 4, N. Y.

"Kodak" is a trade-mark

Radiography

another important function of photography

Kodak

HOW WOULD *You* PRODUCE

FULL-LENGTH HOLLOW CORES *in these Stainless Steel Castings?*

THE PROBLEM: These huge agitator blades for a leading manufacturer of plastics were specified in Cooper Alloy 17S, an austenitic chromium-nickel stainless steel corresponding in alloy content to Alloy Casting Institute's CF 8 designation.

Each casting, measuring seven and one-half feet in length, and weighing one thousand, five hundred and fifty pounds, was designed with a one and one-half inch hollow core running the full length . . . to provide a passage for water or steam with which to heat or cool the blade while in service.

Experience indicated that because of the unusual shape of the blades sand cores would be unsatisfactory and very unlikely to withstand the pressures and metal temperatures during casting.

HOW COOPER ALLOY FOUNDRY SOLVED IT: In place of a sand core, this foundry selected stainless steel tubing of the same composition as the cast alloy. Realizing that heat generated by the poured molten alloy would melt and deform the tubing, Cooper engineers developed a procedure whereby water was continuously forced through this stainless tube while the casting was being poured. Thus, the temperature was held below the melting point of the tube, and a satisfactory cored hole was assured.

Our casting specialists are always glad to help suggest suitable compositions of stainless alloys containing nickel for specific applications. Send us details of your problems for our suggestions.

EMBLEM OF INCO SERVICE
TRADE MARK

Over the years, International Nickel has accumulated a fund of useful information on the properties, treatment, fabrication and performance of engineering alloy steels, stainless steels, cast irons, brasses, bronzes, nickel silver, cupro-nickel and other alloys containing nickel. This information is yours for the asking. Write for "List A" of available publications.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

BETTER CORES = BETTER CASTINGS

...Here are 4 Ways to Improve your Core Making—Use Krause Cereal Binders

Krause Cereal Binders are made under time-tested formulas — their uniform quality is laboratory controlled.

Get the binder advantages you need and want —specify TRUSCOR if you like light weight; AMERIKOR if you prefer the heavy weight. Order from the distributors listed below or direct from us.

CHAS. A. KRAUSE MILLING CO., Milwaukee 1, Wis.
World's largest dry corn millers.

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Milwaukee Chaplet & Mfg.
Co., Milwaukee 4, Wis.
Pacific Graphite Works
Oakland 8, Calif.

Porter-Warner
Chattanooga 2, Tenn.
Smith-Sharpe Co.
Minneapolis 14, Minn.
Frederic B. Stevens, Inc.
Buffalo 12, N. Y.
Frederic B. Stevens, Inc.
Cleveland 14, Ohio

Frederic B. Stevens, Inc.
Detroit 26, Mich.
Frederic B. Stevens, Inc.
New Haven 11, Conn.
Western Industrial Supply Co.
Portland 14, Ore.

KIRK AND BLUM

Plenum chamber hood "cleans up" mold conveyor operation

American Foundry Company Replaces old Dust and Fume Removal System with modern KIRK & BLUM INSTALLATION

As a major step in foundry modernization and clean-up, the American Foundry Company of Indianapolis replaced their old, inefficient mold conveyor hood with a modern, efficient hood, designed and installed by KIRK & BLUM. The old system, as shown in the "before and after" photos, was severely worn; the air withdrawal rate was low, permitting dust and smoke to escape into the foundry.

The new KIRK & BLUM hood is designed so that the top is a plenum chamber, distributing air along the entire length of the hood. Every other panel is removable for access. Four exhaust units connect to the hood; each has a capacity of 13,000 CFM. Total air removed, 52,000 CFM, assures this firm cleanliness never before possible.

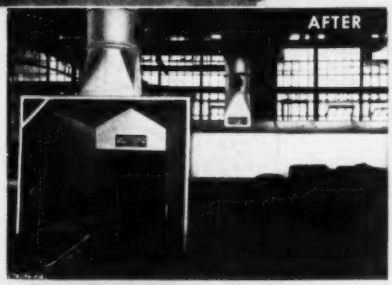
KIRK & BLUM systems, in many of the nation's leading foundries, practically eliminate dust and fumes from traditionally "dirty" jobs. Call the KIRK & BLUM Representative . . . more than 40 years of experience at your command, or ***write for your copy*** of "Dust Collecting Systems in Metal Industries," showing other typical installations. *The Kirk & Blum Mfg. Co., 2876 Spring Grove Ave., Cincinnati 25, O.*

Designed, Fabricated and Installed by Liberty Engineering Div., KIRK & BLUM, Indianapolis, Ind.

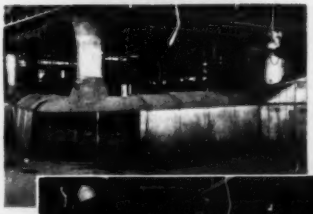
FOR CLEAN AIR . . . THE INVISIBLE TOOL

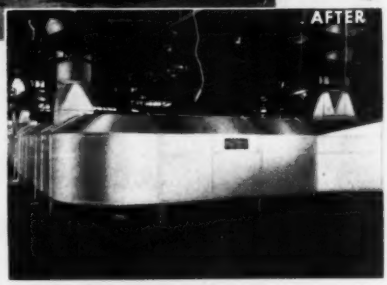
KIRK AND BLUM

DUST AND FUME CONTROL SYSTEMS

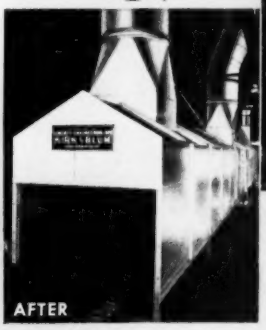


1. Entrance end of hood; note bolted section construction for ease of maintenance of conveyor.

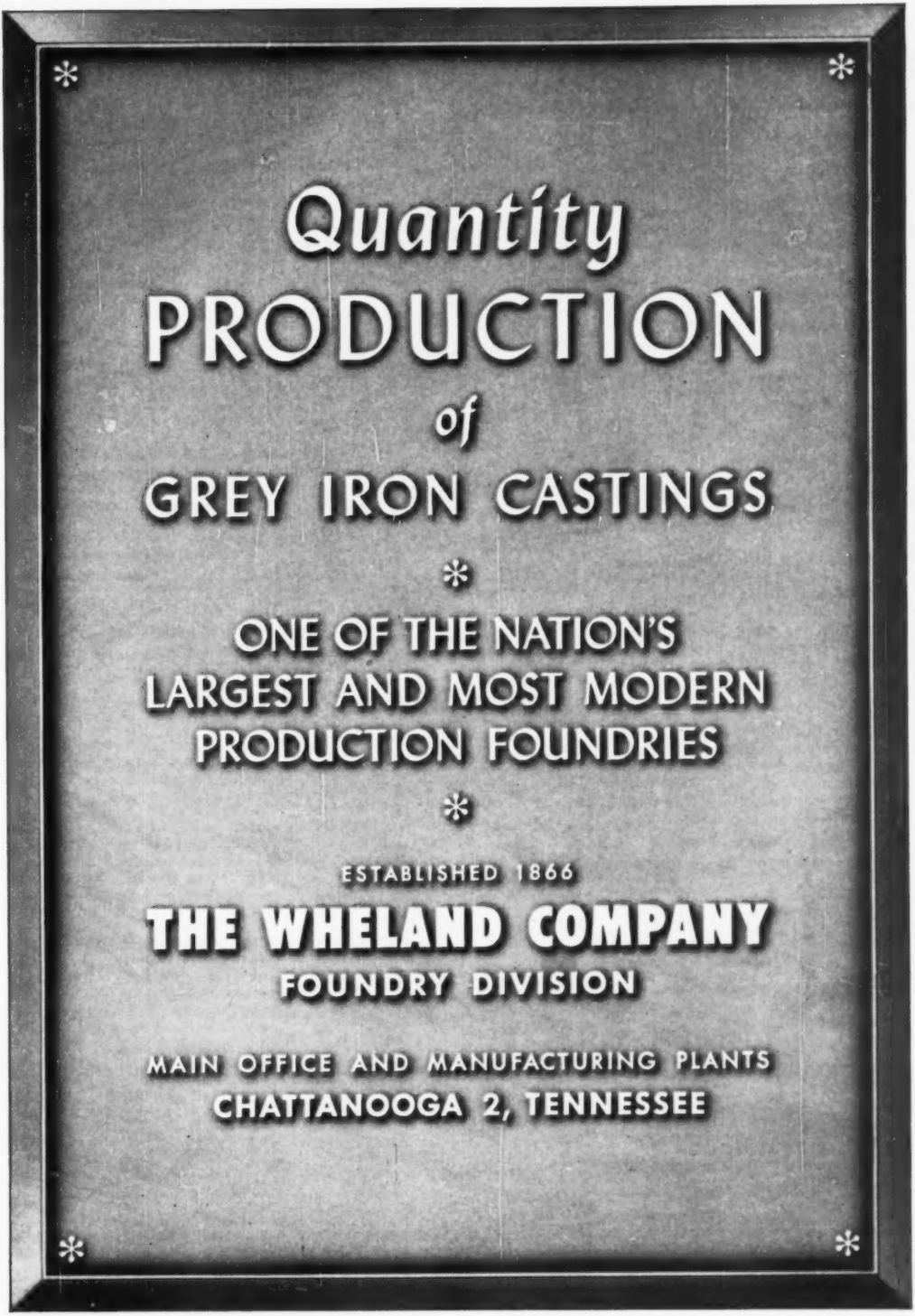




2. Corner of conveyor.-Note that new hood is off floor for ease of cleaning.



3. Exit end of conveyor and hood, showing the four duct-mounted exhausters with total capacity of 52,000 CFM.


Quantity
PRODUCTION
of
GREY IRON CASTINGS
ONE OF THE NATION'S
LARGEST AND MOST MODERN
PRODUCTION FOUNDRIES
ESTABLISHED 1866
THE WHELAND COMPANY
FOUNDRY DIVISION
MAIN OFFICE AND MANUFACTURING PLANTS
CHATTANOOGA 2, TENNESSEE

FOUNDRY FIRM Facts

Alderwood Foundry, Toronto, operated for eight years by the Canadian Scale Co., was recently purchased by six employees of the Canadian Scale Co.—John Stewart, George Henshaw, William Byron, William Brennan, C. Ruben Casson, and Ralph A. Douglas, who managed the foundry for Canadian Scale prior to its purchase. Combined service of these foundry veterans totals nearly 150 years spent in bench and floor molding and coremaking. Alderwood Foundry now employs a staff of 16 persons and its output is principally confined to gray iron castings for machine shops.

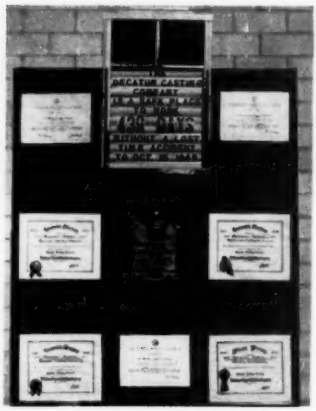
Eaton Mfg. Co., Vassar, Mich., recently participated in that city's Centennial Celebration with a float and exhibit showing permanent mold gray iron castings and their place in industry.

The **Warman-Martin Aluminum Foundry Co.**, Cincinnati, has shortened its name to the **Warman Aluminum Foundry Co.**

Yale & Towne Mfg. Co. has established a new branch office for the sale, repair, maintenance and spare parts service of hoists, scales, and industrial trucks at 815 N. LaSalle St., Chicago.

Morris Bean & Co., Chicago, has awarded a contract for construction of a 60,300 sq ft aluminum precision molding foundry.

Fire of undetermined origin destroyed the interior of a one-story frame building



Eight awards for meritorious achievement in preventing accidents have been made to the Decatur Casting Co., Decatur, Ind., who up to October 15, had 439 days without a lost-time accident.

housing the cleaning room and machine shop of the **Peerless Foundry Co.**, Indianapolis, October 25.

Iron Lung Ventilator Co. is the new name of the **Powermatic Ventilator Co.**, Cleveland. The new name incorporates the company's trade name for its several types of industrial ventilating equipment.

Indianapolis Stove Co.'s foundry blower room was recently destroyed by a two-alarm fire. Damage to equipment was estimated at $15,000 and plant operations were crippled for several days.

Correction

The October, 1949, issue of AMERICAN FOUNDRYMAN erroneously stated—in the Foundry Firm Facts section—that a growth and scale resistant cast iron, Jiscon, is being produced by **Jackson Iron & Steel Co.**, Jackson, Ohio. The company developed the alloy and it is available to interested foundries on a royalty-free basis, but Jackson Iron & Steel does not produce it.

Tungsten Is Now Wolfram World Scientists Decree

THE ELEMENT TUNGSTEN will henceforth be known as wolfram, it was decreed by the International Union of Chemistry, meeting in Amsterdam last September. The name wolfram has been in general usage throughout the world, with the exception of the United States, and the chemical symbol of the element has always been W, the October 1 issue of *Science News Letter* reports.

Other changes from American usage in element names are niobium for columbium, lutetium for lutecium, and protactinium for proto-actinium. Beryllium replaces the term glucinium, which has been generally used in Europe, and the term hafnium was given world approval.

U. S. Bureau Of Standards Issues 1948 Report

SCIENTIFIC ACTIVITIES at the National Bureau of Standards during 1948 are reported in 272-page illustrated booklet recently published by the Bureau and available from the U. S. Government Printing Office, Washington, D. C.

Reported in this volume is the work of the Bureau's 13 research divisions, including four of particular interest to foundrymen—metallurgy, chemistry, mineral products and heat and power. Of the numerous projects carried out by these divisions only those of the greatest general interest and widest application are described.

The Annual Report of the National Bureau of Standards for 1948, 272 pp., 39 halftone illustrations, is available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., at 25 cents per copy.

Miss Opal Burns of Hamilton Foundry & Machine Co., Hamilton, Ohio, receives a five-year service pin from Peter E. Rentschler, company president, at Hamilton's fifth annual Service Pin Award Dinner, September 12.

4 REASONS WHY

FERROCARBO Briquettes help produce top quality Cast Iron

1 MORE EFFECTIVE DEOXIDATION

Readily soluble in molten iron, the components of FERROCARBO briquettes provide powerful deoxidation. Oxides are reduced and eliminated. Super-heated iron of greater fluidity is obtained. Foundry operating variables are reduced. Cleaner, sharper castings are poured.

2 IMPROVED STRUCTURE

Irons which have been deoxidized with FERROCARBO briquettes are characterized by a dense, close-grained structure, free from chill or porous areas even though varying widely in metal section. Segregation is eliminated.

3 SUPERIOR MECHANICAL PROPERTIES

The use of FERROCARBO briquettes insures iron structure with higher physical values.

4 PROLONGED TOOL LIFE

Iron which is deoxidized with FERROCARBO briquettes promotes longer life of the machine tools.

CUPOLA addition of FERROCARBO silicon carbide briquettes to a properly adjusted charge greatly lengthens the useful life of all types of cast iron. For metallurgical advice on their use in your operation write Bonded Products and Abrasive Grain Division, Niagara Falls, New York.

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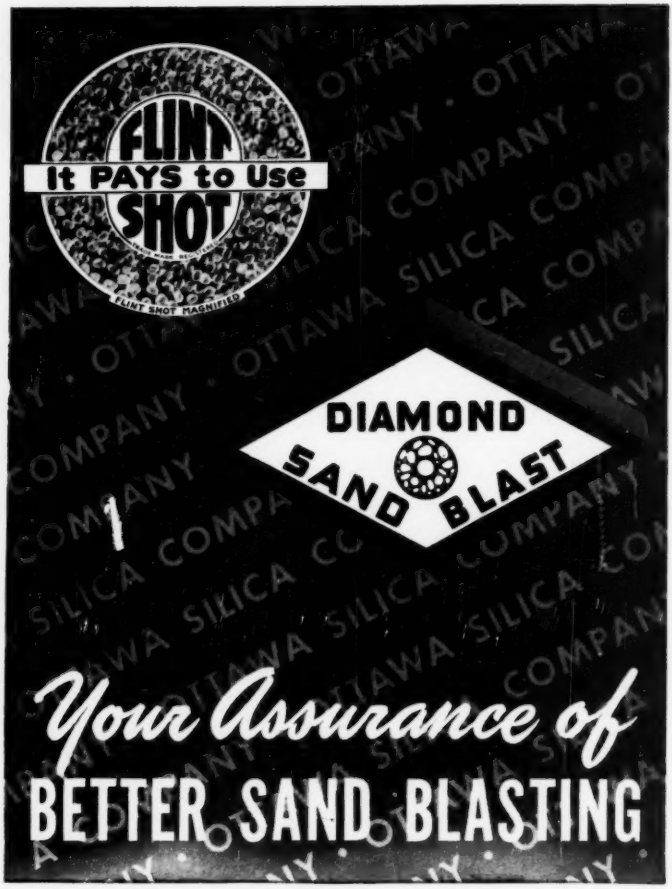

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CHAPTER ACTIVITIES

(Continued from Page 71)

Myers Co., Ashland, Ohio; and *Non-Ferrous*, M. G. Winters, Winters Foundry Co., Canton.

The coffee talk was given by Paul Ebert of the Ohio Boxboard Co. on the subject, *"Know Yourself."* Mr. Ebert, an ordained Lutheran minister, told many interesting anecdotes interspersed with homespun humor and down-to-earth logic.

Timberline

James L. Higson
Western Foundry
Chapter Reporter

THE FIRST MEETING of the 1949-50 season, held September 26 at the Silver Wing Cafe, Denver, had as its speaker Frank G. Steinebach, Penton Publishing Co., Cleveland, whose topic was *"What's Ahead in the Foundry Industry."*

Mr. Steinebach's talk proved enlightening and thought provoking. The meeting was attended by 45 chapter members and their guests.

Northern California

Milton Oakes
American Brake Shoe Co.
Publicity Chairman

NOVEMBER 11 meeting featured an enjoyable and educational talk by Ralph L. Lee, General Motors Corp., on human relations in industry. In his talk, Mr. Lee covered many of the problems that arise daily in personnel relations and gave several excellent solutions to the problems. The meeting was held at the Ville de la Paix, Oakland.

Members of the Chapter interested in sand problems met November 9 at the Robin Hood Inn, Oakland, to hear Charles Schureman, National Bentonite Co., answer questions on various sand topics.

Chesapeake

Jack H. Schaum, National Bureau of Standards, and George L. Webster,
Baltimore Polytechnic Institute
Chapter Reporters

OCTOBER MEETING program did not lack for variety. Members and their guests heard Assistant Superintendent Sylvestry of the Baltimore School System tell of plans for a foundry in a vocational school to be completed in Baltimore within the next two years. Following Mr. Sylvestry's talk an excellent color film on historic and scenic Maryland was shown.

The assembly then divided into groups for round table discussions.

The Gray Iron round table was presided over by Clyde L. Frear of the Navy's Bureau of Ships. The dis-

cussion covered experiences in the making of nodular iron, and such cupola practices as bed building, electric lighting, hot blast and use of oxygen.

Clausen A. Robeck of the Gibson & Kirk Co., Baltimore, led the Non-Ferrous round table discussion. Ideas were exchanged on the causes and cures of dross in 80-10-10 castings and of gas porosity in other alloys.

Heading the Steel round table was Harold Bishop, Naval Research Laboratory, who reviewed some of his work in studying the feeding range of steel risers. Also discussed were devices for keeping risers open.

Saginaw Valley

Kenneth H. Priestley
Vassar Electroloy Products, Inc.
Chapter Reporter

"SUPPLIER'S NIGHT" was the designation of the November 3 meeting, held at Fischer's Hotel, Frankenmuth, Mich., and attended by 225 members and guests, including 50 suppliers.

Edward McFaul, Midwest Institute, Chicago, spoke on *"So You Think You're Slipping,"* a highly interesting and humorous non-technical talk.

Northeastern Ohio

Robert H. Herrmann
Penton Publishing Co.
Chapter Reporter

APPROXIMATELY 215 foundrymen attended the October 13 meeting at the Tudor Arms Hotel, Cleveland, to hear talks by William T. Bean, Jr., Detroit foundry consultant, and John E. Fintz, assistant superintendent of schools, Cleveland.

Mr. Fintz spoke in connection with the presentation of Federal Apprentice Training Service Certificates to 13 patternmaking apprentices. These apprentices, guests of the patternmaking group of the chapter, recently completed a five year course of training. In his talk, Mr. Fintz stated that among the aims of a trade school program are to make education a continuous part of life and to help educational systems to dignify honest labor.

Oscar Poole, regional director, Apprentice Training Service, Department of Labor, presented the certificates of completion to John A. Dow, Clifford Dukes, Harry E. Farner, Frank Gangale, Frank P. Gill, Albert Jazbinski and Mike Pachan. Apprentices who had earned their certificates but were absent included Kent Arthrell, Charles Blaha, Alfred Drozdowski, Frank S. Kozielski, Joseph Rovniak and Edward Valentovic.

Mr. Bean, technical speaker of the evening, spoke on *"Good Casting Design—on Purpose."* Mr. Bean stated that, in his opinion, foundrymen should not merely pour a casting, but they must engineer a product. Three things are important in developing a cast product—using the proper material, adopting the correct design and determining the load to which the product will be subjected, Mr. Bean said.

Tennessee

Carl A. Fischer, Jr.
Fischer Supply Co.
Chapter Reporter

THE SECOND DINNER meeting of the season was attended by 68 members and guests at the Hotel Patten, Chattanooga, October 28.

Speaking on *"Permanent Mold Castings,"* Howard Wilder, Eaton Mfg. Co., Vassar, Mich., outlined the history of permanent mold castings and described latest developments in permanent molding machines and methods.

The speaker described a method of producing gray iron castings in volume in mechanically-operated metal molds without the application of pressure. Permanent mold cores, venting, mold and core coatings, cupola charging and pouring practices were outlined by the speaker in his talk.

Advantages of the permanent mold process, according to Mr. Wilder are free machinability of castings, uniform

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structure and dimensional accuracy, close tolerances and ability to take a high finish. Use of permanent molds is however limited to rather small, thin castings, he concluded.

Rochester

Donald E. Webster
American Laundry Machinery Co.
Chapter Reporter

NOVEMBER MEETING featured a talk by James H. Smith, Central Foundry Division, General Motors Corp., Saginaw, Mich., on *"The Future of the Foundry Industry."*

Mr. Smith said that development of new materials, refinements in foundry practice; opening up of new casting fields and training of personnel must be accomplished by the foundry industry today and in the future if it is to keep abreast of the times.

Mr. Smith cited the importance of foundry education, development of new foundry products and selling methods as essential to the future of the foundry industry.

Missouri School of Mines

Jack Absalom
Chapter Reporter

THE OCTOBER MEETING of the Student Chapter brought several St. Louis foundrymen to the school.

Alfred Vigne, Bronze Alloy Co., St. Louis, was the evening's speaker. His talk on *"The Problems of Producing a Casting"* was augmented by a colored film strip taken at the company's plant. Many problems found in the production of pressure tight nonferrous castings were presented and explained. The film strip brought out further difficulties that must be solved. Engineering problems were frequently mentioned to show students the problems which will confront them when they leave school.

Parent's Day at the School of Mines found the Student Chapter busy operating the foundry as one of the exhibits. Aluminum souvenir ash trays were cast and given to parents as they left. As each group of the several hundred that visited the foundry came through, George Wagner explained the various operations and equipment.

Many visitors congratulated those working and remarked that this was the first time they had ever seen a casting operation.

Philadelphia

A. J. Saute
Publicity Chairman

THE FIRST MEETING of 1949-1950, had an attendance of more than 200 members and guests who visited the Philadelphia Navy Yard on October 14.

The visitation was sponsored by George Bradshaw, master molder, and

Captain Kniskern, Commandant of Philadelphia Navy Yard, who later in the evening was guest of the chapter at dinner. At the Navy Yard foundry, the pouring of a 70,000 pound propeller casting was the feature event. The machining of a propeller casting, similar to the one seen poured, was observed and a wartime submarine was inspected.

William Johnson, U. S. Naval Research Laboratory, Washington, D. C., spoke on "*Gating Systems.*" The program was presented in three parts, using motion picture films, and covered "*Finger Gating*," "*Step Gating*" and "*Gating Systems for Metal Castings.*"

Cincinnati District

John F. Kahles
University of Cincinnati
Chapter Reporter

SPEAKER at the October 10 meeting, held at the Engineering Society, Cincinnati, was William T. Bean, Jr., Detroit foundry consultant, whose topic was "*Simplification of Light Metal Design, and Its Effect on Serviceability.*"

Mr. Bean said that neglect of either material, design or load factors results in casting instability.

Mr. Bean emphasized need for evaluation of materials in a casting, rather than in a standard test bar. He showed how evaluation of loads made by SR-4 strain gages has proved that elimination of ribs in castings leads to lighter and stronger parts.

Mr. Bean concluded by saying that the foundry process can produce a metal product of more uniform stress distribution than can be produced by any other method of metal working.

Washington

Harold R. Wolfer
Puget Sound Naval Shipyard
Chapter Reporter

A.F.S. FILM. "*Fluid Flow in Transparent Molds*," was accompanied by a running commentary by S. C. Massari, A.F.S. Technical Director, at the October 21 meeting, held at the Gowman Hotel, Seattle. Mr. Massari also outlined the A.F.S. Research Program and explained the duties of the Society's Technical Director.

The film is a visual record of the work being done at Battelle Memorial Institute, Columbus, Ohio, on one of eight A.F.S. Research Projects.

Through the medium of the transparent mold shown in the film, it was easy to follow progress of a fluid consisting of water in which aluminum powder was suspended. The influence of various gating arrangements on turbulence of the liquid and the amount of entrained air in the liquid stream was clearly shown.

As shown by the film, it is desirable

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The 90° bend under the head simplifies your operation and places the chill where it belongs. The "Koolhead 90°" will perform two duties: (1) a chill and (2) holding the sand on the surface of the mold. We feature clean, bright finished Horse Nails and can furnish the new bent head in any of the various "Koolhead" types.
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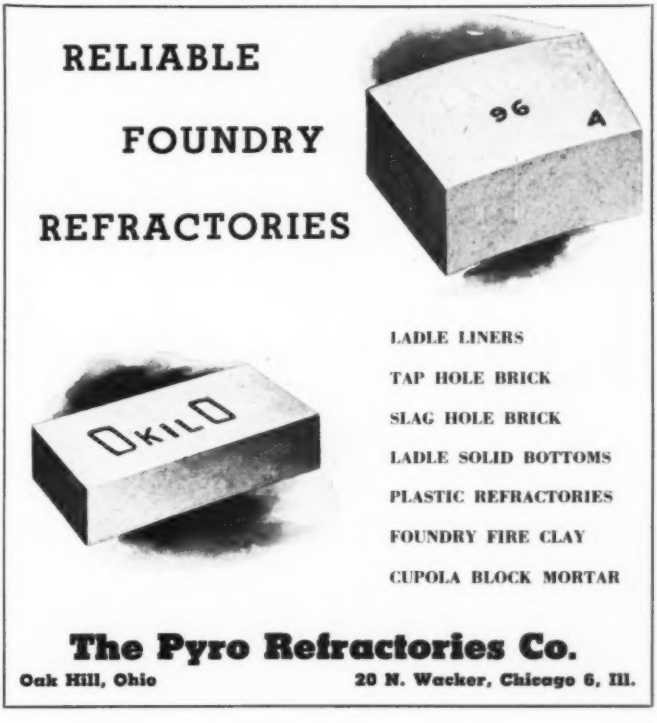

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Tepco Ferro-Silicon Briquettes, used mainly for the addition of silicon to the cupola charge of iron foundries, are most convenient because they contain a certain definite weight and can be counted instead of weighed. At the same time, the briquettes are more valuable than lump ferro-silicon because the binder in the briquettes protects the ferro-silicon as it is melted in the cupola and a greater return of silicon is obtained by that means.

Tepco Ferro-Silicon Briquettes are produced at our Chattanooga plant (formerly Southern Ferro-Alloys Company, Chattanooga, Tennessee). The 2½-pound briquettes contain one pound of silicon and the 5-pound briquettes contain two pounds of silicon.

Tepco Ferro-Silicon is also available in all sizes from lump through 150 mesh by down, packaged or in bulk—50%, 65% and 75% standard and low impurity grades. Special grades and sizes quoted on request.

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Tepco's high-grade pig iron includes two preferred types:

Diamond D Pig Iron — low-phosphorous, low-silicon, high-carbon, machine cast — preferred for Nodular Graphitic Cast Iron and all White Iron Castings.

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that mold corners be rounded and that the pouring basin be kept full and quickly filled from the start, among many other points brought out.

It has been established by this research project that a definite relationship exists between area of sprue, runner and gate for given mold pouring speeds in order to allow the metal to fill the mold cavity without turbulence. The transparent mold is a tool which will enable the research group to find the ratios which give best results. By correlation, these results can be applied to actual gating systems, using metal and sand molds. This project will thus in effect work out a practical interpretation of the hydraulics of fluids in molds, Mr. Massari said.

Announcement was made of tentative plans to hold a Northwest Regional Foundry Conference in 1950, to be sponsored jointly by the Washington, Oregon and British Columbia Chapters and held on the campus of the University of Washington.

Ohio State University

Dallas M. Marsh
Publicity Chairman

CONTROL OF SAND GRAIN distribution was the topic of Speaker Clyde A. Sanders, American Colloid Co., Chicago, at the November 1 meeting. Mr. Sanders explained that a foundry can save money and produce castings of better quality if it will determine the proper grain distribution for its type of work and will set up a system of control to maintain that distribution on all casting jobs.

As a second topic Mr. Sanders pointed out several courses of action which engineering students might follow to make themselves of maximum use to the foundry industry upon graduation. His remarks were especially pertinent to chapter members, since they are nearly all enrolled in the Foundry Option of Industrial Engineering at the University, and plan to enter the foundry industry upon graduation from the University.

On October 22, the chapter held a Fall picnic at Scioto River Park in Columbus. Nearly 30 people were present, including members, friends and the chapter advisors of the Ohio State University student chapter, Professors D. C. Williams and R. P. Schneider.

After a strenuous afternoon of football and softball the picnickers were served a baked ham dinner. Arrangements for the picnic were conducted by Chapter Member John Anibal. Chapter Members Edward Losely, Harold Gonya, Croft Merritt, and David Baker also contributed their services to the picnic.

BOOK REVIEWS

Alloy Metallurgy

Structure and Properties of Alloys, by R. M. Brick and Arthur Phillips. Second edition, 485 pp, illustrated with photographs, tables and graphs. Published by McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 18. $6.00. (1949).

Nearly twice the size of the first edition of this well-known text, the revised edition is expanded to include discussion of additional alloys in present chapters, and two new chapters on Magnesium Alloys and Corrosion and Heat-Resistant Alloys, and includes 64 new tables and 116 new graphs. As in the first edition, the general approach to the subject is maintained—correlation of phase diagrams structures and properties of alloys—from the simplest to most complex alloys. This edition is profusely illustrated with photomicrographs showing alloy structures, origins and deviations from the normal. Other features of the new edition are: expansion of the non-ferrous section; rewriting of the chapters on steel; heat treatment and hardenability of steels now considered in terms of austenite transformation diagrams; more attention to isothermal transformation diagrams; many new alloys discussed; twice the number of photomicrographs; and almost all new questions for each chapter.

Industrial Hygiene

Industrial Health Engineering, by Allen D. Brandt, B.S., M.S., Sc. D. 395 pp. Illustrated with charts, drawings and photographs. Published by John Wiley & Sons, Inc., New York, $6.00. (1947).

Written to assist industrial hygiene engineers, plant engineers and construction and consulting engineering firms to determine proper health controls and equipment in industrial installations, this volume provides a condensed, practical coverage of latest developments in the industrial hygiene field.

Included in the contents of *Industrial Health Engineering* are chapters on atmospheric contaminants—their evaluation as health hazards and methods of control, general ventilation, local exhaust ventilation—hood design, design of local exhaust systems, collectors, exhausters, measuring flow in industrial ventilation, control measures for common industrial operations, exhaust systems—design and installation, respirators and protective clothing; heating, ventilating and air conditioning for temperature, humidity, comfort and odor control; radiant energy, industrial illumination, industrial noise and its control and plant sanitation and hygiene. Concluding the volume are an extensive bibliography and an appendix of tables useful in establishing industrial health control installations.

The author, Dr. Allen D. Brandt, is industrial hygiene engineer for the Bethlehem Steel Co. His career as one of the nation's foremost authorities on industrial health includes wartime supervision of non-medical phases of industrial hygiene in all Army-owned explosives, manufacturing and loading plants, as well as service in the United States Public Health Service and in industry.

Manufacturing Processes

Manufacturing Processes—Materials, by S. E. Rusinoff, 393 pp., photos, diagrams and charts, 6x8½. Published by American Technical Society, Chicago (1949).

The first 132 pages of this 393-page book are devoted to the production of castings. Of these, 98 pages are devoted to sand casting while 34 pages are given over to other casting methods such as permanent mold, semi-permanent mold, die casting, centrifugal casting, plaster mold casting, investment mold casting. Chapter 1 covers patternmaking; Chapter 2 deals with molding and coremaking; Chapter 3 covers melting and melting equipment and pouring of molten metal into molds; Chapter 4 deals with other casting methods mentioned above. The book contains one chapter on heat treatment of metals, one on welding, brazing and soldering and one on plastics and their applications. These chapters would be of interest to foundrymen. The book contains numerous illustrations and is clearly written. It is well suited for trade

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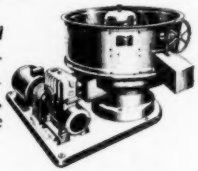

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Metals and Alloys

Engineering Metals and Their Alloys, by Carl H. Samans, 913 pp. Published by The Macmillan Co., N. Y. (1949).

This volume covers the principles and practices of metallurgy and is excellent for the student of metallurgical engineering or for the practicing engineer or metallurgist who feels the need to brush up on metallurgical fundamentals. It is profusely illustrated with excellent charts, graphs, photos and photomicrographs. The book covers both extractive and physical metallurgy and is comprehensive in scope. It deals with ferrous and nonferrous metals and their commercial alloys from the standpoint of applications and end uses. The theory of alloys and the principles of heat treatment are thoroughly covered. A few of the subjects discussed in the book are fabrication of metals; corrosion, its effect and control; alloys resistant to chemical corrosion and action of heat; alloys for applications requiring high strength and toughness, general wear and abrasion; tool materials; bearing alloys. There are 18 pages specifically devoted to foundry processes. The book contains a 26-page subject index.

Management

Bottom-Up Management, by William B. Given, Jr. 171 pp. Not illustrated. Published by Harper & Brothers, New York. $2.50. (1949).

The management philosophy of the author, president of the American Brake Shoe Co., that the human factor is the most important element in business management, is explained in this readable, informative book. *Bottom-Up Management* is the result of Mr. Given's experiences in managing one of the world's largest foundry operations.

In this book the author explains the day-by-day operation of his theory of "bottom-up management" in encouraging creative contributions by employees to insure a firm sense of partnership with management, and to stimulate wholehearted interest and loyalty on the part of the lowest rank-and-file employee up to top management of an organization.

Chapter I of Mr. Given's *Bottom-Up Management* appeared on Pages 30-32 of the September issue of *"The Foundrymen's OWN Magazine."*

Non-Ferrous Alloys

Metals and Alloys, Fifth Edition, 214 pp., clothbound. Published by Louis Cassier Co., Ltd., London, and available from Iliffe & Sons, Ltd., Dorset House, Stamford St., London, S.E. 1.

Specifications of more than 4,500 nonferrous alloys, containing less than 50 per cent iron, are listed in this book. The previous revision of *Metals and Alloys* covered some 3,700 alloy compositions. This volume represents a complete revision, involving the rejection of many alloys known to be no longer manufactured, and the addition of several hundred alloys not covered in previous editions.

PERSONALITIES

(Continued from Page 63)

Mr. Minton has been with Battelle since 1941, with the exception of a period spent on the War Metallurgy Committee of the National Academy of Science and the National Research Council.

John B. Stevens, a 1949 graduate of the Massachusetts Institute of Technology, where he was a member of the A.F.S. Massachusetts Institute of Technology Student Chapter and a recipient of a Foundry Educational Foundation scholarship, has been appointed a foundryman-trainee with the Bethlehem Steel Co., Bethlehem, Pa.

Robert Spurgin, III, formerly superintendent of Swayne, Robinson & Co.'s foundries, Richmond, Ind., has been named director of development engineering and methods for that organization. Mr. Spurgin is a director of the A.F.S. Central Indiana Chapter.

S. W. Aitken of the Hammond Lane Ironfounders, Dublin, Ireland, chairman of the Irish Ironfounders' Association, was a visitor to the A.F.S. National Office, Chicago, October 3, and attended a meeting of the A.F.S. Chicago Chapter.

C. W. Tuttle, purchasing agent for the Indiana Foundry Corp., Muncie, announced his resignation as of October 1.

Hugh Gauld has been named manager of the Great Western Smelting Co., Ltd., Vancouver, B. C., Canada, following the resignation of **R. S. McQuillan.**

L. P. Moore has been named manager of New Products Development and **E. W. Cook** European technical representative for the American Cyanamid Co.

Lawrence M. Ricketts, Jr., was recently elected vice-president and assistant treasurer of the Poole Foundry & Machine Co., Baltimore, Md.

L. F. A. Mitchell, formerly manager of headquarters sales for the Crockett-Wheeler Electric Mfg. Co., will head nondestructive testing services and equipment sales for Sperry Products, Inc., Danbury, Conn. Mr. Mitchell was at one time manager of sales for Canadian Westinghouse Co., Ltd.

R. H. Elder, staff writer for the American Cast Iron Pipe Co., Birmingham, Ala., since the war, has resumed his prewar position as chief chemist for the company. During World War II, Mr. Elder served as a Colonel in the Army Chemical Corps. **Roy E. Deas,** who has been serving as acting chief chemist, has been appointed chief analyst.

A. C. Runnette succeeds **Wiser Brown** as manager of sand and permanent mold casting product sales for the Aluminum Co. of America. Mr. Runnette was for-

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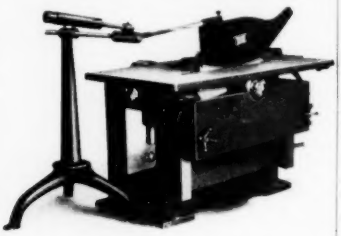

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Write for Bulletin No. 45

OLIVER MACHINERY COMPANY
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merly manager of Alcoa's Jobbing Product Sales Div. since 1943. Mr. Brown will now devote his full time to Alcoa's subsidiary, American Magnesium Corp., of which he is general manager.

Vernon H. Patterson has been appointed to the sales development staff of the Climax Molybdenum Co., New York. Mr. Patterson was formerly sales metallurgist for the American Brake Shoe Co.

Clayton D. Grover, since 1942 vice-president of Whitehead Metal Products Co., Inc., a subsidiary of the International Nickel Co., New York, was recently elected a director of the company. Mr. Grover has been with International Nickel and its subsidiary companies since 1925, when he became a member of the staff of Inco's Huntington Works Physical Laboratory at Huntington, W. Va.

Victor Paschkis, technical director of the Heat and Mass Flow Analyzer Laboratory of Columbia University and director of the A.F.S. Heat Transfer Research Project, has been elected president of the Society for Social Responsibility in Science, an international organization of scientists, whose aim is to foster constructive scientific efforts, rather than science which furthers war and the destruction of humanity.

Rudolph Nuske, formerly assistant foundry superintendent for the Budd Co., Detroit, has been appointed superintendent. Mr. Nuske has been active in the foundry industry in the Middle West for over 30 years.

Diderik Cappelen, recent graduate of Massachusetts Institute of Technology and member of the A.F.S. student chapter there, visited the Society's National Office while touring midwestern foundry areas prior to going home to Norway the first of the year.

Harold M. Gade of the department of metallurgical engineering, University of Alabama, has been appointed an assistant professor in that department.

OBITUARIES

Henry Rosenstein, 44, retired foreman of the National Malleable Iron Works, Indianapolis, died November 11 at his home in Indianapolis. Mr. Rosenstein had been employed by that company for 25 years.

Henry W. Priep, 71, president of the Laclede Stoker Co., St. Louis, died September 22 after a prolonged illness. Mr. Priep joined the Tower Grove Foundry, St. Louis, in 1904. Tower Grove and Laclede were consolidated in 1932, and Mr. Priep became president of Laclede in 1937.

Albert J. Laforet, 55, salesman for the Buckingham Products Co., Detroit, in its Michigan territory for more than 12 years, died October 17 while on vacation in Washington, D. C.

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COPPER AND IRON FREE, a new nickel alloy developed by the Waukesha Foundry Co., Waukesha, Wis., has high resistance to corrosion, good machinability and freedom from any tendency to seize or gall when used in moving contact with itself or other metals, including stainless steels.

Available in cast form only, Waukesha Metal Alloy No. 23 does not require heat treatment, and in the as-cast condition has a tensile strength of 50,000 to 60,000 psi, an elongation of 7-10 per cent, and a brinell hardness of 145-165.

Lengthening Grinding Wheel Life

IF GRINDING WHEELS wear down too fast, here are a few remedies offered in a current issue of *Grits and Grinds*, the external house organ of the Norton Co. of Worcester, Mass.:

"If some of your present wheels seem to be wearing fast, check the grain and grade specifications. They may have been ordered for some other job and are too soft.

"Be sure the wheels are not being dressed away. When truing or dressing a wheel, ordinarily it should not be necessary to remove more than a few thousandths from the grinding face to put it in truth or restore a clean, sharp cutting surface.

"Check the wheel speed to be sure it is close to the operating speed recommended by the manufacturer. If it is much lower, the wheel will act soft and wear fast.

"Use a wheel of the largest diameter and thickness that is practicable. Try to use the stubs down to a smaller diameter on another grinder. If necessary, the hole size can be reduced to fit a smaller spindle by making an adapter or loose bushing. Of course, the grain and grade of the wheels should be reasonably suited to the jobs on which the stubs are utilized."

Offer Free Home Study Blue Book And Directory

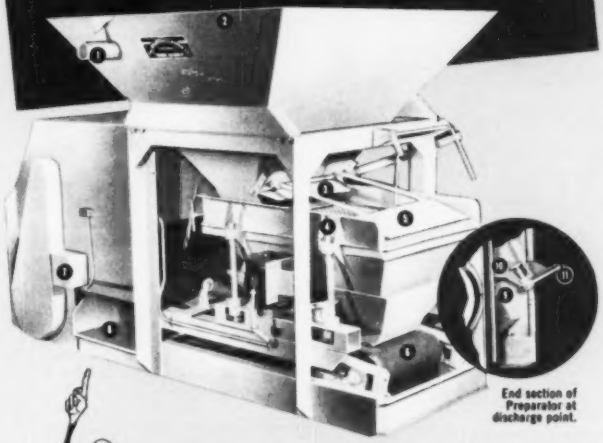
HOME STUDY COURSES, what they offer and approved schools where they are taught are the subjects of the *Home Study Blue Book*, offered free-of-charge to readers of AMERICAN FOUNDRYMAN by the National Home Study Council, Washington, D. C.

Included in the *Blue Book* is a history of U. S. correspondence schools and the opportunities they afford for specialized training in many branches of industry, science and the arts. Means by which industries and other organizations can utilize these courses as an integral part of their training programs are explained. Concluding the volume is a comprehensive list of courses offered at Council-approved correspondence schools throughout the country.

Copies of the *Home Study Blue Book* may be obtained gratis from the National Home Study Council, Washington 6, D. C. Also published by the Council are *Approved Technical Institutes* and *Directory of Private Business Schools in the United States*. Both booklets are offered free to students and vocational counselors.

COMPLETE SAND CONDITIONING WITH MAGNETIC SEPARATION

in one portable unit



End section of Preparator at discharge point.

Here tramp iron is discharged from machine into scrap box . . . an exclusive Preparator feature.

Newly designed and streamlined, the Preparator provides your foundry with an efficient, dependable, heavy duty, portable sand conditioner. This one machine screens, breaks lumps, magnetically separates, aerates and discharges sand up to 35 feet into pile or bin. Load centered trunnions permit easy movement by crane. Rugged construction assures years of service, even with the roughest of treatment. Completely conditions up to sixty tons of sand per hour!

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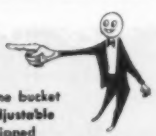

Preparator easily lifted by Trunnions [1]—and moved to any desired location by crane. Shakeout sand is loaded by crane bucket or loader into large open top hopper [2] and feeds through adjustable gate opening [3] onto heavy duty Gyratory Screen [4] equipped with adjustable lump breaker [5]. Screened sand drops onto belt conveyor [6] and passes over magnetic pulley [7] which separates tramp iron into scrap box [8]. The cleaned sand falls onto drum type aerator [9] which discharges it to any distance up to thirty-five feet. The adjustable deflector plate [10] controls the distance the sand is thrown. The water spray [11] at discharge point, provides final tempering.

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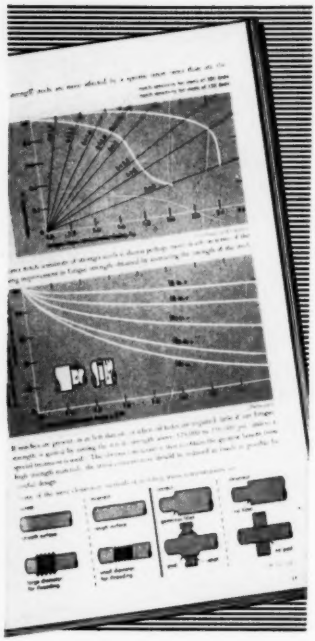

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NEW PRODUCTS

(Continued from Page 73)

of Pettibone Mulliken Corp., are designed to carry such bulk materials as foundry sand, coke and limestone. Lattice frame conveyors are sectionalized, with head and tail sections having complete shaft and pulley assemblies, and are of heavy welded angle iron with butt joints rigidly bolted. Channel frame conveyors are built with frames in convenient lengths, with head and tail sections in separate assemblies. Features of the Model 487 conveyors include anti-friction bearings, extra-heavy shafts; self-aligning roll shafts, close spacing of troughing rolls to insure even load distribution, sealed-for-life troughing roll and return idler bearings. Conveyor can be used with flat belt or trough belt on any type of portable or stationary mounting, elevating or horizontal. Bulletin H-487 is available.

Hydraulic Fluid

DC19—Lindol HF-X, a new flame-resistant tricresyl phosphate base hydraulic fluid can be used on any system equipped for non-hazardous fluid operation, or in any other system with but few changes. Manufactured by Celanese Corp. of America, Lindol HF-X is not a chlorinated compound and does not give off noxious fumes when exposed to very high temperatures. Other features are high lubricity, corrosion resistance and low cost. Manufacturer claims that initial cost for Lindol HF-X is lower than that of any comparable material and that lowered maintenance and down time offer added economies.

Immersion Thermometers

DC20—A series of high temperature immersion thermometers for temperature readings to 1 per cent accuracy from 350 F to 1500 F, or equivalent centigrade, are announced by Seico, Inc. Each thermometer has a 4-in. diameter, 240° dial scale, with a scale length of 8 in. Temperature ranges of six models range from 50 F to 350 F, up to 200 F to 1500 F. Advantages claimed are lightness in weight, low internal pressures at all temperatures, fast response and ability to withstand hard continuous use without loss of accuracy. Prolonged immersion in liquids within temperature ranges will not cause damage or accuracy loss.

Dry Lubricant

DC21—Applicable as a lubricant in foundry mechanical equipment subject to heat is Molykote lubricant Type Z, developed by the Alpha Corp., which is a smooth-textured molybdenum compound powder whose treatment and composition renders it adaptable to extreme bearing pressure applications. Properties are exceptional chemical and thermal stability and inertness, tenacious adherence to metal surfaces, acid resistance, and lubricating characteristics not affected by temperatures from sub-zero to 750 F. Type Z may be applied dry in powder form or may be mixed with solvents or oils.

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LITERATURE

(Continued from Page 74)

signed to aid foundry owners and operators to determine handling costs and means of reducing them.

Piston Size Calculator

DC114—A handy vest-pocket slide rule available from Milwaukee Foundry Equipment Co. makes determination of best molding machine piston size easy. A single setting takes into account air line pressure, flask area, sand pressure, and piston diameter. Guide to appropriate sand pressures for different casting alloys is given in a table on the back of the slide rule.

Casting Design Factors

DC115—Evaluation of the importance of good design and its relationship to the selection of steel and its heat treatment is the subject of "*3 Keys to Satisfaction*," issued recently by the Climax Molybdenum Co. Design factors involved in stress concentrations, choice of steel and its heat treatment are discussed. Sketches compare poor and good designs from the standpoint of subsequent metallurgy. Booklet is available on request to all engineers and designers.

Manganese Bronze Hardener

DC116—Properties and applications of "Falls" No. 21 Manganese Bronze Hardener are described in a bulletin recently published by the Niagara Falls Smelting Div., Continental Copper & Steel Industries, Inc.

Ferro Alloys

DC117—"*Electromet Ferro Alloys and Metals*," newly-published catalog of the products of the Electro Metallurgical Div., Union Carbide & Carbon Corp., describes more than 50 metals and alloys produced by the company, and Electromet's technical service for the foundry industry.

Fluxes

DC118—Bulletins describing the properties and applications of Famous Cornell cupola, aluminum, brass and ladle fluxes are available from the Cleveland Flux Co. free of charge.

Impeller Casting

DC119—*Mechanical Topics*, Vol. 11 No. 4, external house organ of the International Nickel Co. contains a short article describing how the life of impellers used to pump water in the coke quenching tower of the Brooklyn Union Gas Co. was increased three times by casting them from "S" monel instead of cast iron.

Radioactive Tracers

DC120—Believed to be the most extensive available bibliography on the uses of radioactive tracers in industry, Arthur D. Little, Inc.'s recently-published 13-page booklet is available without charge. Listed are general background references, survey articles of industrial applications, and references dealing with such specific fields as metallurgy and mining, radiography, instruments, etc.

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A. F. S. Employment Service

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HELP WANTED

HW514—Foundry Superintendent. Modern non-ferrous production; must be conversant with nickel, monel and bronze castings. Write, giving qualifications.

HW516—Steel Foundry Metallurgist—with practical experience in melting, heat treating and sand control in a modern steel foundry producing carbon, low alloy heat and corrosion resisting steels. Must be technical graduate capable of establishing technical controls and to handle metallurgical sales service.

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PW120—Manager/Gen. Superintendent. Top flight gray iron foundry manager or general superintendent. Thirty years' experience in production, rigging, plant layout and methods, research work, inventions and modernization. Ten years' experience with Meehanite metal, sales, customer contact, design and engineering. Available only to progressive foundry, light or heavy castings in gray iron or high physical property metals.

PW122—Gray Iron Foundryman. Age 49, U. S. citizen. Practical and technically trained. Commercial jobbing. Production automotive. Thirty-two years experience. Thoroughly capable of assuming executive responsibility. Excellent reference. Salary expected: $12,000, plus bonus.

PW123—Assistant Metallurgist or Foreman. Six years' experience in chemical and physical testing, metallurgy and cupola practice. Good record for handling men. Prefer work that will be educational in iron metallurgy. Veteran. Married, two children. Age 26. Excellent, well-known references.

PW124—Controller-Treasurer. Capable of coordination of office and shop activities; creation and supervision of meaningful reports; making and following through decisions. Background: assistant to treasurer, industrial engineer, secretary-treasurer of steel foundry. Experience: cost accounting, cost control, standards and incentive systems, credits, insurance, property and inventory control, payroll and office management. Married. Age 34. Prefer the Southwest.

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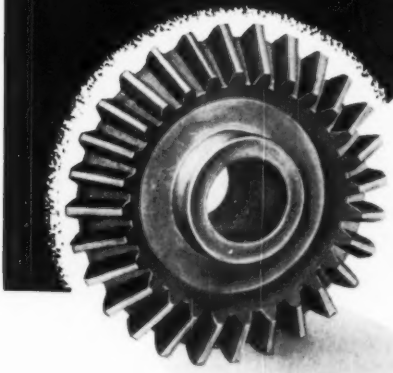
Lavin's Aluminum Bronze



Gears, valve seats, bushings, bearings, propellers, pump parts, pickling tank castings and baskets and marine equipment are prepared with these alloys which are available up to 90,000 p.s.i. tensile strength and with more than 12 per cent elongation in 2 inches without heat treatment.

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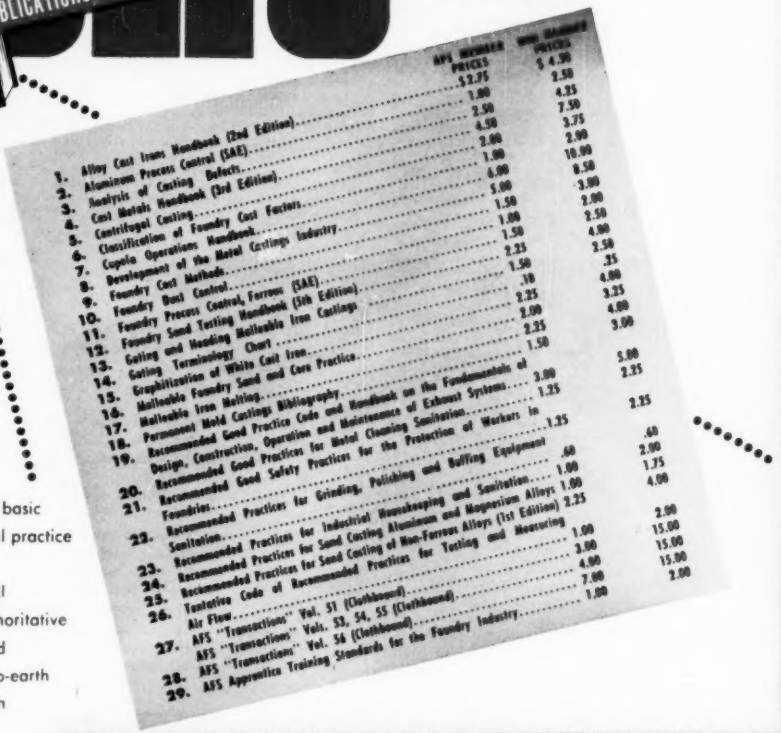

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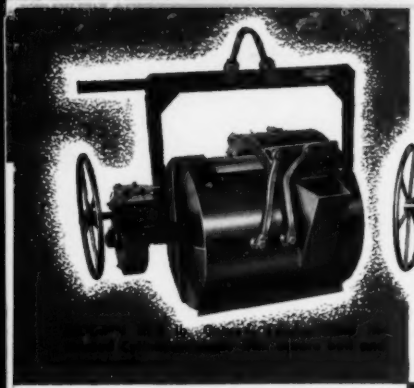

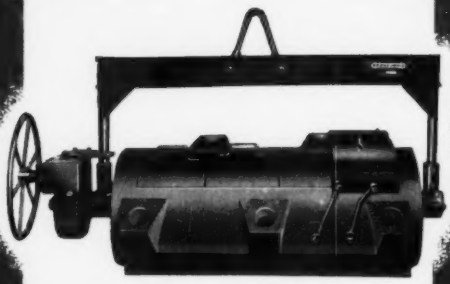

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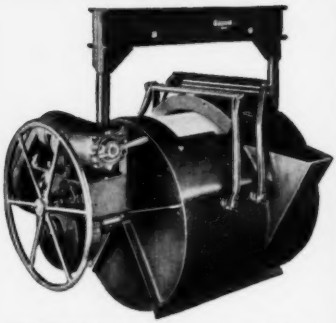

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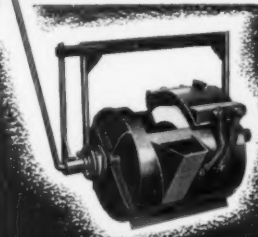

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